NOVEMBER 22, 1945

American Machinist

Air Power in Metal Working

SIZE-MATIC DOES HIS THINKING FOR HIM!

The Heald Method of Automatic Sizing Means Faster Production . . . Fewer Rejects in Internal Grinding

Add up the time your operators spend with plugs, gages, feelers, calipers—or any other manual method of checking size in internal grinding operations—and you have the best reason in the world for finding out now about automatic sizing—*the Heald way*. With a Heald Size-Matic Internal on the job, for example, your operators *don't have to think* about when your work is to size. The Heald Size-Matic knows!

An "automatic brain" is built into your Size-Matic. It assumes entire responsibility for sizing, by predetermining the exact number of wheel passes required to bring the work to the desired hole size. Sizing is done without any connection with the work. It makes no difference whether you're grinding straight or tapered holes; with or without keyways; open-end or blind; large or small. A Heald Size-Matic means that all your men do is load the work and throw the starting lever to give you faster work and better work—automatically.

MISCELLANEOUS RUNS OR VOLUME PRODUCTION

Only the simplest adjustments are required on a Heald Size-Matic to make it suitable for large production runs, or a wide variety of assorted jobs. In either type of work, tolerances are easily held within ten-thousandths. Exact uniformity is assured.

Heald has proved this automatic principle through 20 years of successful use. But a Size-Matic is only one way of securing the advantages of Heald experience with automatic operation, to gain faster, better lower cost production. Why not ask a Heald Engineer to come in and lay some interesting and profit-making facts before you?

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

More Precision · Less Cost **HEALD**

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING

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American Machinist Chips

Coming Features . . . In the next (December 6) issue of *American Machinist* we will present a detailed breakdown of the status of Metal-Working's production equipment—other than machine tools—by industries and by geographical areas. Many readers have requested such data and thanks to the splendid cooperation of the firms who helped us prepare the 1945 Inventory of Metal-Working Equipment, this additional information is being passed along to you. To our knowledge this is the first time in history that a comprehensive study of this type has been presented.

Just as the first part of the 1945 Inventory (AM 7/5/45) was used as a yardstick by readers in comparing the obsolescence of their machine tools against those operated by other plants in the same line of business and same geographical areas, this new section on welding, forging, press, materials handling and other equipment will permit more thorough comparisons. Tip-offs on trends in equipment set-ups in various divisions of the Metal-Working Industry will be included.

Reprints of this special study will be available—as are those of the previous one on machine tools. Watch this column in the next issue for the coupon.

Also in the December 6 number will be a story telling how the design of larger induction heating coils, more basic in type and operating with high currency, induces economies in processing small lots. Job shops interested in heat-treating and brazing with high-frequency equipment will find this article of particular interest.

Among other items coming up is a story which perhaps should be titled "The Solution Was Nuts!" Actually, walnut shell flour solved the problem of speeding the deburring of precision hydraulic equipment. Various tests leading to the choice of walnut shells will be described by William L. Lewis, an aeronautical engineer.

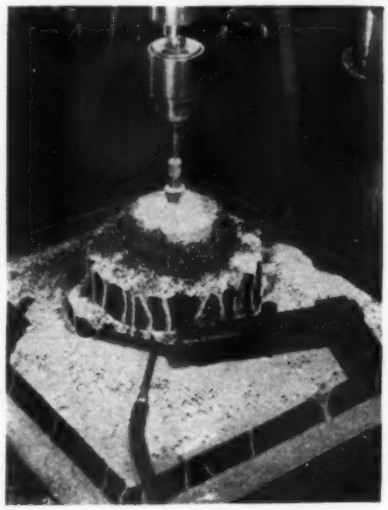
Getting Around . . . Ben Corrado, *American Machinist* editor who has a very keen nose for sniffing out current and coming news in Metal-Working, attended a while ago the American Standard's Association reception in New-York.

While there he met a certain Colonel Wong, who is one of the representatives of the Chinese government and who has traveled extensively in that capacity.

When Ben "carelessly" mentioned *American Machinist*, Colonel Wong said "I know your magazine very well. I first ran across it in a shop in Sweden years ago. The copy I saw was the 1937 issue which had an article in it on the manufacture of small arms ammunition. I wired to a friend in the U. S. to get me two copies."

We are not sure which article the good Colonel had reference to. Our Armament Sections didn't begin until September 1940. Be that as it may, we still say "it is a small world."

Yum Yum . . . Cake a la Metalworking is the cover design for this Nov. 22 *American Machinist*. What at first glance might easily be mistaken for a succulent cake shimmering with



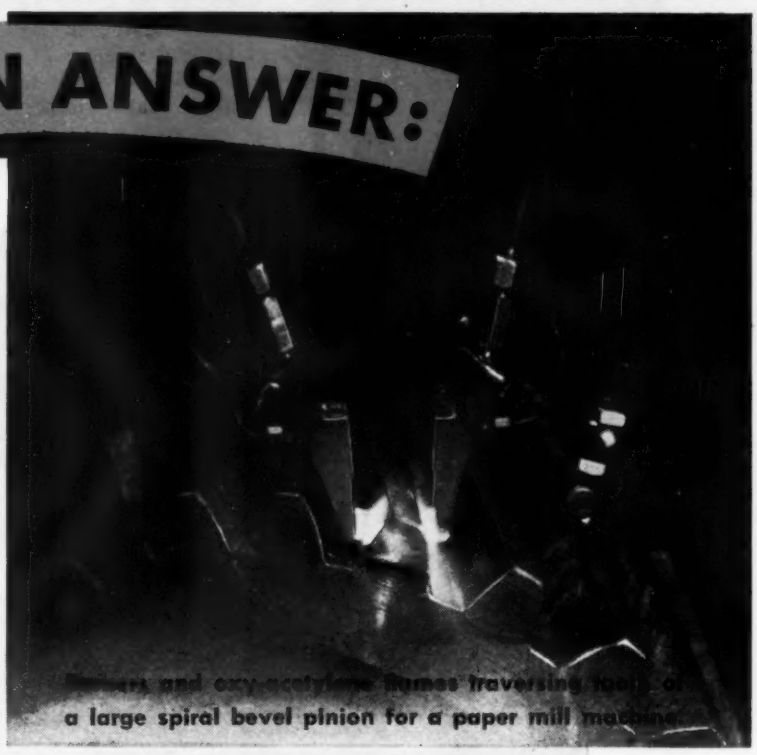
creamy icing is actually a vertical collet unit with coolant being pumped by air through the bottom of the collet chamber and through a hole in the work. Chips, which give a decorative affect to the metal "cake," are flushed away by the coolant as fast as they fall from the tool. The cover picture ties in with an article in this issue on how the field of pneumatic fixtures will receive wider use in peacetime production.

Don't look at me—the lady on the other shift had that idea.

Courtesy Pontiac Motor Division's "Factory Fun" and artistic employe L. N. Kramer

Why Surface Harden Gear Teeth?

THE GLEASON ANSWER:



Burners and oxy-acetylene flames traversing tooth of a large spiral bevel pinion for a paper mill machine.

1. Maximum wear resistance with minimum distortion is produced by the Gleason localized hardening method, because each tooth is hardened individually, employing an oxy-acetylene flame and an air quench.

2. Uniform hardness for each tooth is attained by automatic operation of machines used.

3. The installation and operating cost is low. There is only one machine to buy, which, by use of simple, replaceable burner tips can handle a wide range of sizes and pitches of bevel, spur, and internal gears. Also, only a small supply of oxygen and acetylene is required.

4. Thousands of gears surface hardened by the Gleason method are in daily use. These range from small, instrument-type gears to large gun mount drives.

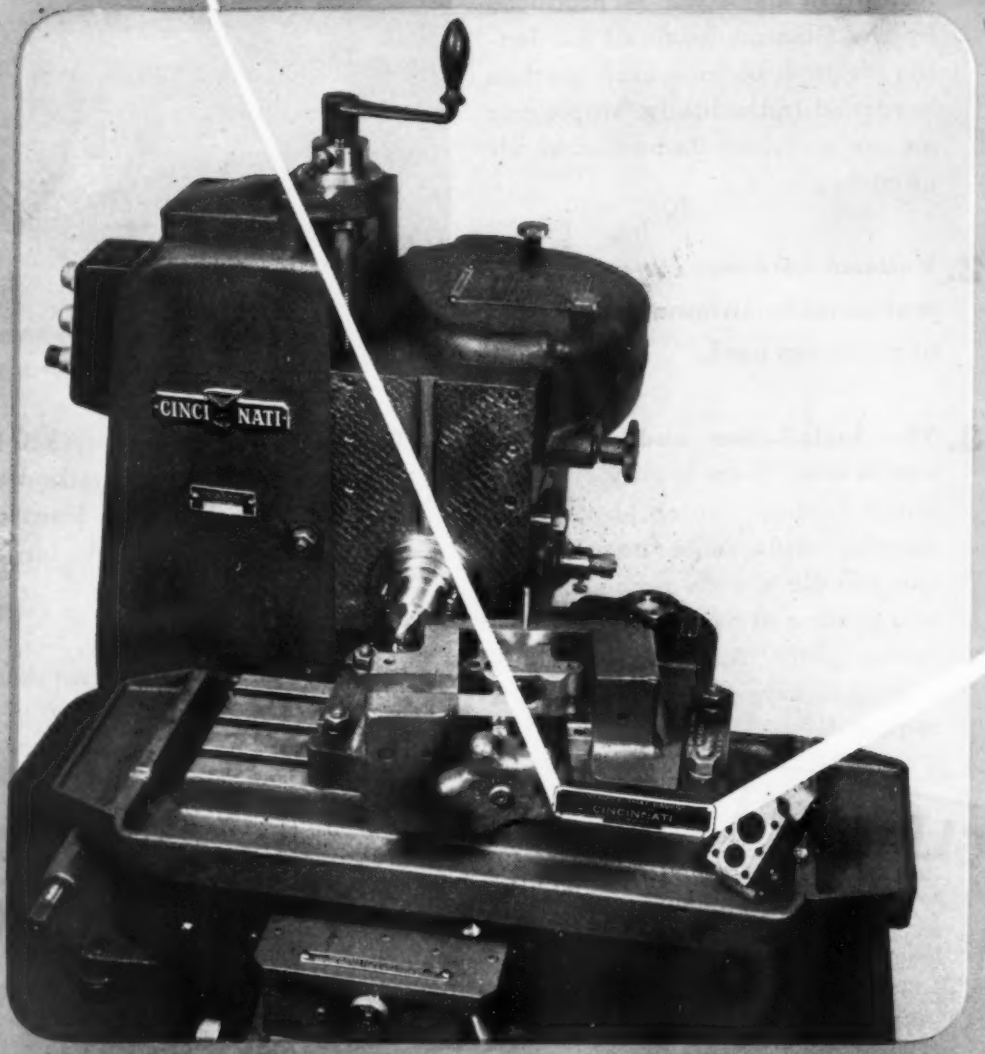
It should be noted, of course, that the initial core strength and mountings must be adequate.

GLEASON Works
Builders of BEVEL GEAR MACHINERY FOR OVER EIGHTY YEARS

For further information on the Gleason surface hardening method and machines, write on your company letterhead for descriptive bulletin "The Surface Hardening of Gear Teeth." The Gleason Works, Rochester 3, New York, U.S.A.

Hardening a lot of large spiral bevel gears for oil well machinery on the No. 2 Gear Surface Hardener.

"SERVICE



CINCINNATI *No. 0-8 Plain Automatic Miller, tooled up for milling a 10° bevel on refrigerator compressor cylinder. The hand-clamping fixture holds one work piece. Automatic Table Feed Cycle and Power Table Traverse of 400" per minute makes possible a high production rate of 157 parts per hour.*

CINCINNATI

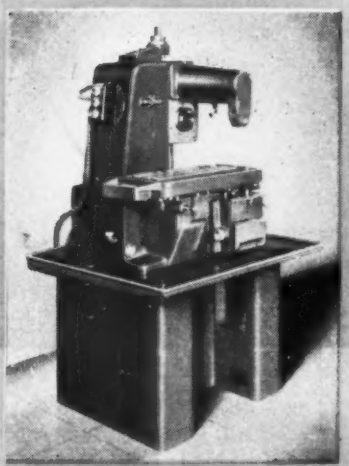
THE CINCINNATI

MILLING MACHINES

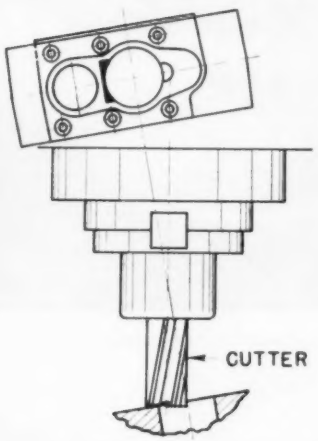
THAT SAVES"

takes on an even greater meaning

The wealth of experience gained under the stress of war means that Cincinnati's well-known slogan, "Service That Saves" takes on even greater significance because our engineers have made many new and revolutionary machining applications a reality. ¶ These engineers will be glad to give you the benefit of many years of experience and machining know-how in the development of a simple fixture for a standard miller, as illustrated on the opposite page, or complete tailor-made equipment for fast, economical, accurate production of many products for civilian use. Feel free to talk over your milling problems with Cincinnati Application Engineers.



CINCINNATI *No. 0-8 Plain Automatic Miller. Complete specifications may be obtained by writing for Catalog M-964-3. A brief description is given in Sweet's Catalog File.*



Sketch of the part being milled by the equipment shown on the opposite page.

Part Name — Compressor cylinder.

Material—Cast Iron.

Operation—Mill 10° bevel.

Production — 157 parts per hour.

Machine — CINCINNATI No. 0-8 Plain Automatic.

MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

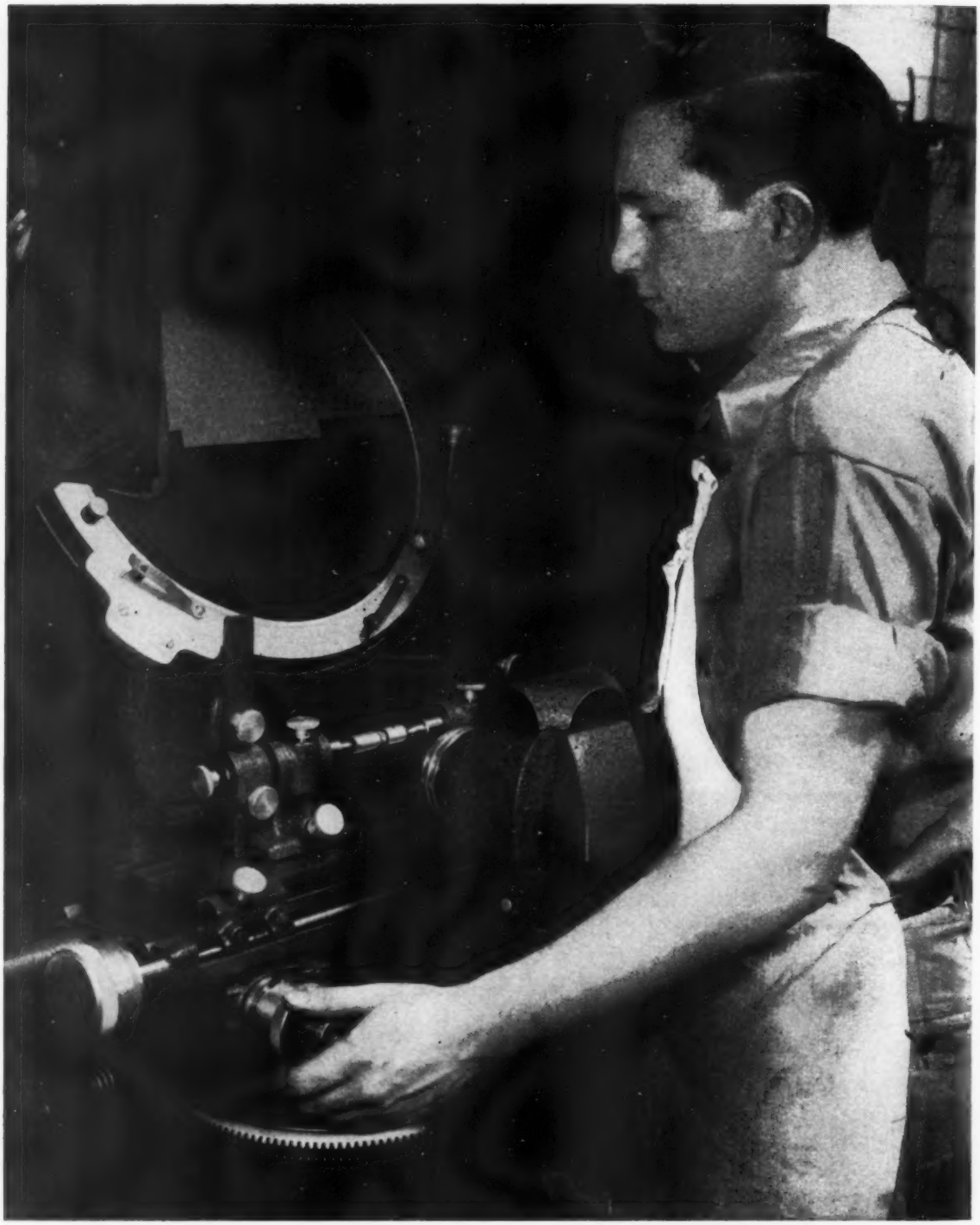


Photo courtesy of United Precision Products Company, Chicago, Illinois

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

DID YOU KNOW...
THAT JONES & LAMSON OPTICAL COMPARATORS ARE USED TO INSPECT KNITTING NEEDLES AND SINKERS USED FOR KNITTING RAYON FABRICS

15 minutes...

AS COMPARED WITH ½ a day!

Precision gages and pins are checked for "utmost accuracy" on a Jones & Lamson Pedestal Optical Comparator and Measuring Machine in less than one tenth of the time it formerly took to inspect them without a Comparator. They are inspected for Length, Depth, Outline, Angles, Straightness and Grooves. This Optical Comparator is also used for inspecting Form Tools, Threads and other Profiles.

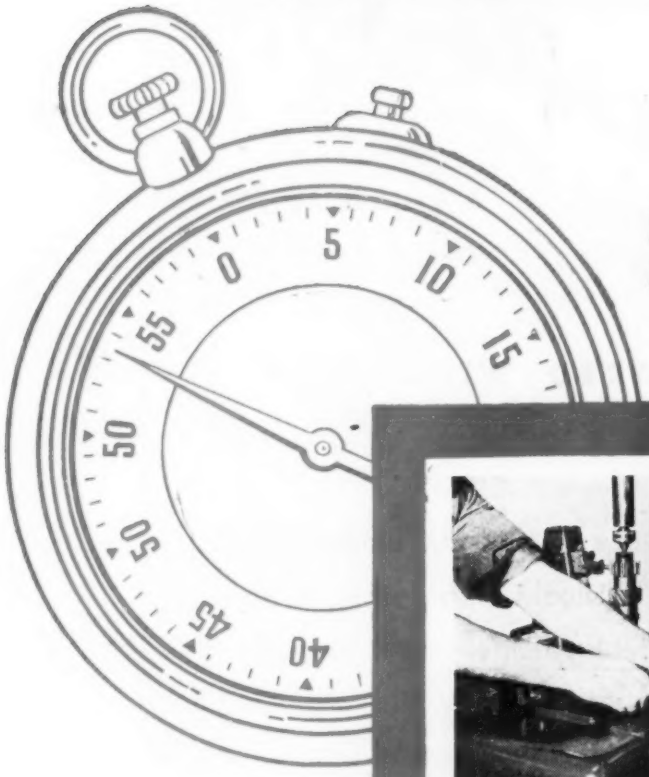
JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS
STANDARD BENCH COMPARATOR
BENCH COMPARATOR 14" DIAM. SCREEN
DIRECT PROJECTION COMPARATOR
STANDARD PEDESTAL COMPARATOR
PEDESTAL COMPARATOR 30" DIAM. SCREEN

INVOLUTE PROFILE CHECKING..



P.D. setting changed from I.9091 inch to 4.0909 inches
in a matter of seconds!

1 I.9091 inch P.D. Spur Gear. Set Main Slide with 0.897 inch gage block.

2 2.3182 inch P.D. Helical Gear. Substitute I.0892 inch gage block.

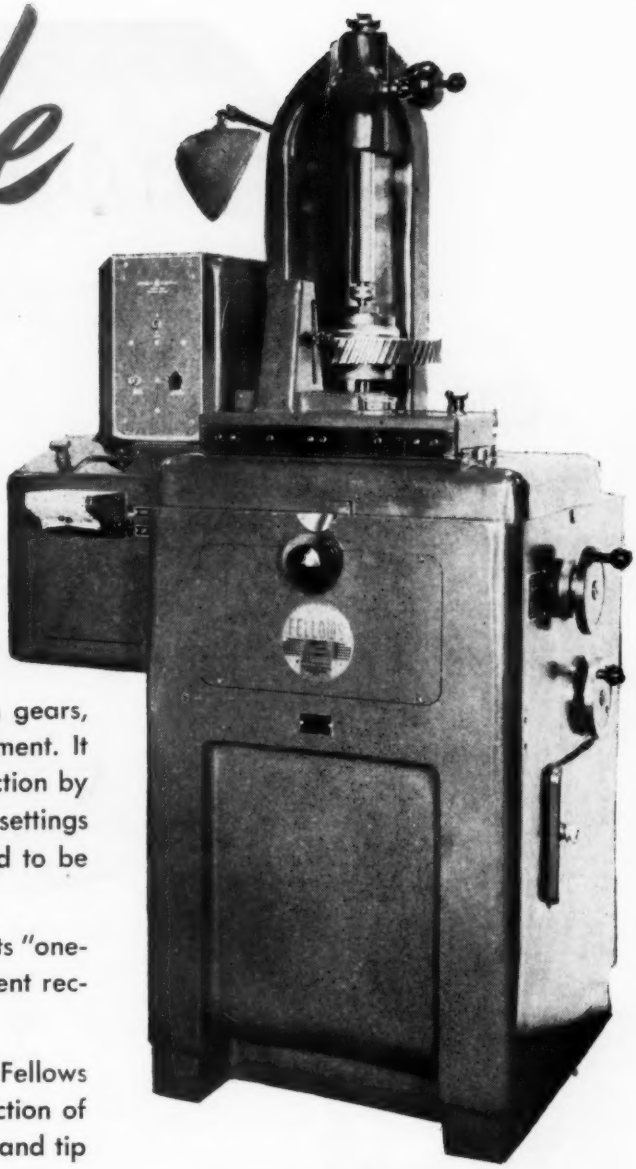
3 3.2727 inch P.D. Helical Gear. Substitute I.5377 inch gage block.

4 4.0909 inch P.D. Helical Gear. Substitute I.9221 inch gage block.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

...so Simple

NO SHOP CAN AFFORD TO BE WITHOUT IT



No. 12M Fellows Involute Measuring Instrument for gears up to 12 inches P.D. A larger model for gears up to 24 inches is also available.

Sooner or later, if you're manufacturing precision gears, you will need a Fellows Involute Measuring Instrument. It saves time, labor and simplifies tooth profile inspection by eliminating the use of base rolls, sine bars, fussy settings and calculations. No modern gear shop can afford to be without it.

You can detect errors in tooth profile visually by its "one-ten-thousandth" dial indicator—or chart a permanent record on the electronic recorder.

In addition to checking the involute profile, the Fellows Involute Measuring Instrument also simplifies inspection of other tooth elements, such as under-cut, high fillet, and tip relief, both as to angular location and amount.

Let our sales engineer explain further the advantages that can be gained through the use of this instrument. Your inquiry will receive prompt attention. Write: The Fellows Gear Shaper Company, Springfield, Vermont, or 616 Fisher Building, Detroit 2, Michigan, or 640 West Town Office Building, Chicago 12, Illinois.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

GRINDING FIBER RINGS

2500 per hour thru-feed

300 per hour infeed

CINCINNATI

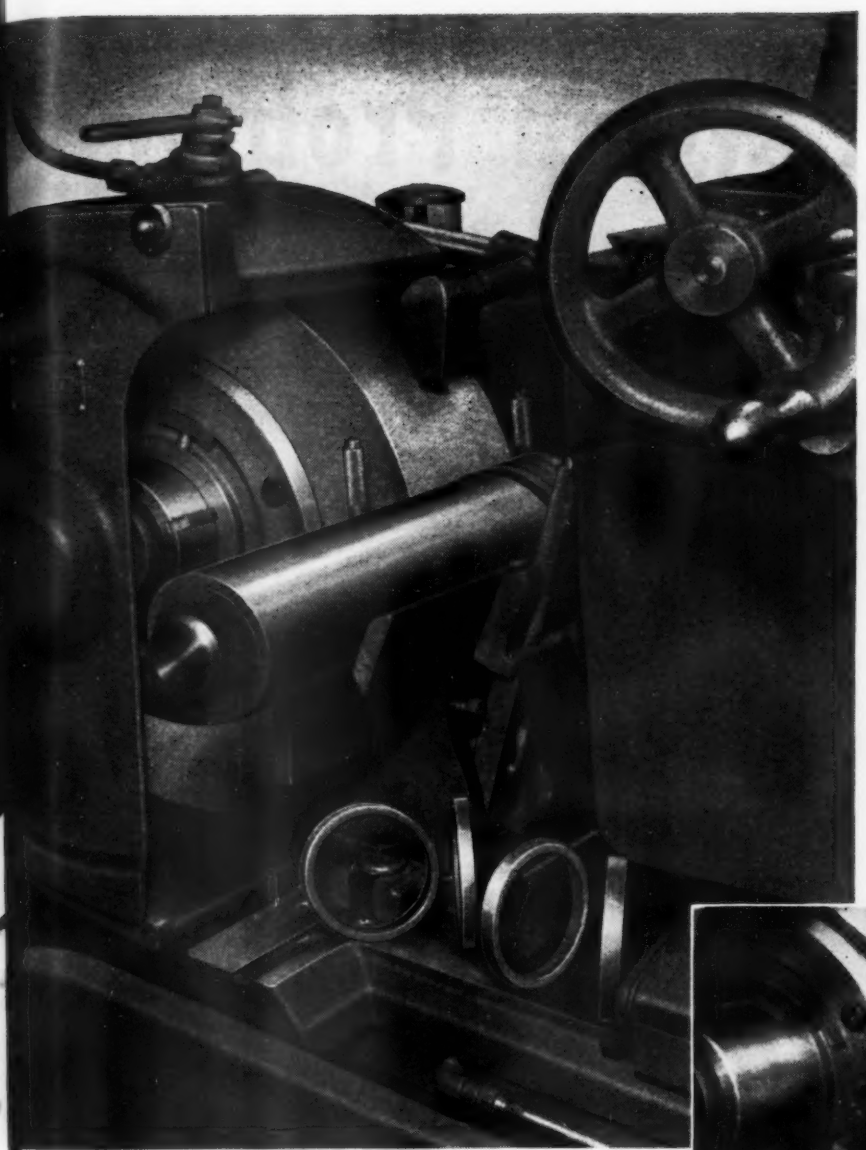
. . . another example of CINCINNATI CENTERLESS Production Possibilities

In the development of centerless grinding methods, Cincinnati Application Engineers have made noteworthy strides. The illustrations on the opposite page are good examples. By equipping a CINCINNATI No. 2 Centerless Grinder with specially designed fixtures, grinding the O. D. and shoulders on fiber rings became a simple yet fast and accurate operation. ¶ The exigencies of the past few years have accentuated grinding developments for war needs. Now these methods are being applied to the production of peacetime goods made of ferrous and nonferrous metals, glass, plastics, hard rubber, cork, porcelain and other nonmetallic substances. It's quite possible that some of these developments could be worked into your own manufacturing schedules. Why not talk it over with the Cincinnati Application Engineers?

CINCINNATI *No. 2 Centerless Grinder. Complete specifications may be obtained by writing for Catalog G-456-2. A brief description is given in Sweet's Catalog File.*

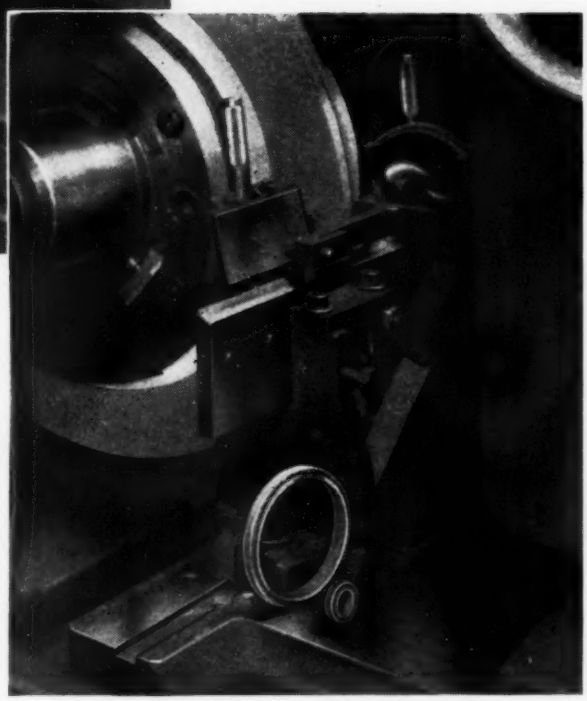
CINCINNATI

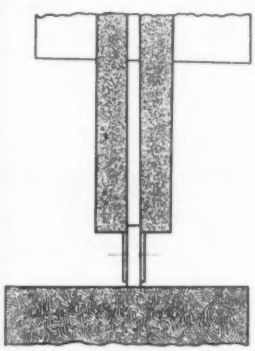
CENTER TYPE GRINDING MACHINES



Eight sizes of fiber rings, 1" to 4¾" diameter, and ⅜" thick are Thru-Feed ground on a CINCINNATI *No. 2 Centerless, using interchangeable arbors. Production is 2500 per hour. Equipment includes Special Work Rest.*

This is the second operation . . . infeed grinding the shoulders. Special equipment consists of Work Rest and Loading Device, two Grinding Wheels and Two-Wheel mount. Production averages 300 to 350 per hour.





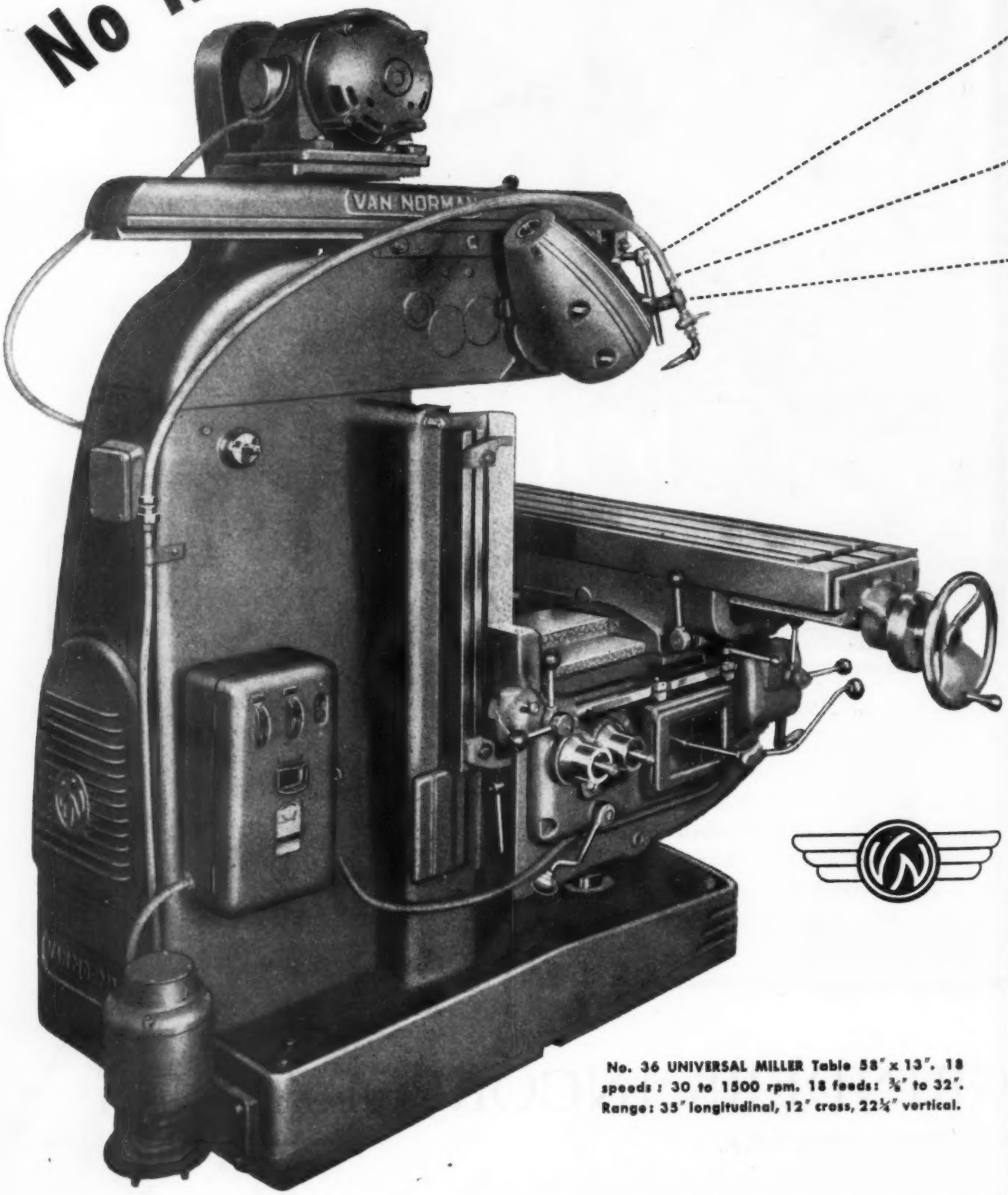
The sketch at the left illustrates the infeed operation of grinding the shoulders from the solid.

GRINDERS INCORPORATED

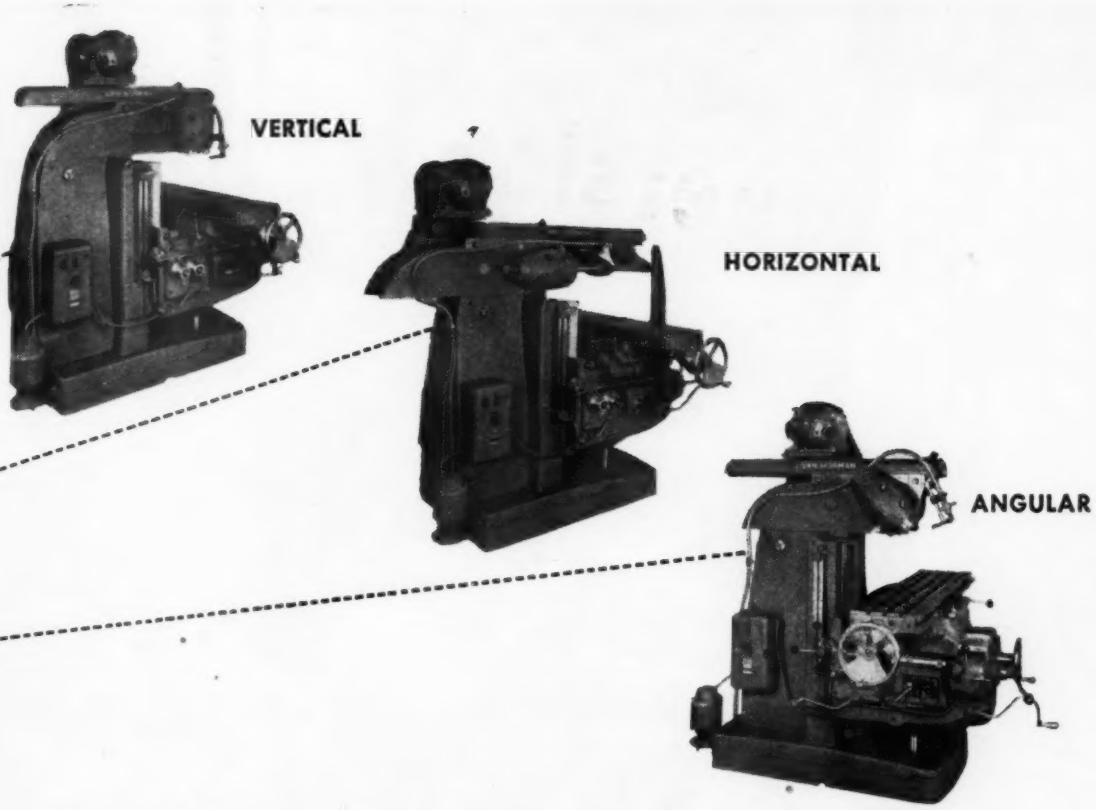
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

No Reconversion Problems



No. 36 UNIVERSAL MILLER Table 58" x 13". 18 speeds: 30 to 1500 rpm. 18 feeds: 3/8" to 32". Range: 35" longitudinal, 12" cross, 22¼" vertical.



...with VAN NORMAN Ram-Type Millers on the job

Here's a milling machine that not only meets today's war requirements but will also be ready to use when you *reconvert*, tomorrow . . . because the adjustable cutterhead makes it adaptable to many jobs. This means that no matter what your milling jobs are . . . horizontal, vertical or angular . . . they can be produced on Van Norman Ram-Type Millers. The result is no idle machine time, a daily profit from continuous machine operation and greater miller production capacity. And that's not all . . . the versatility of the swiveling cutterhead permits many jobs to be carried through to completion without changing the original work set-up with subsequent reduction of rejects through more accurate work.

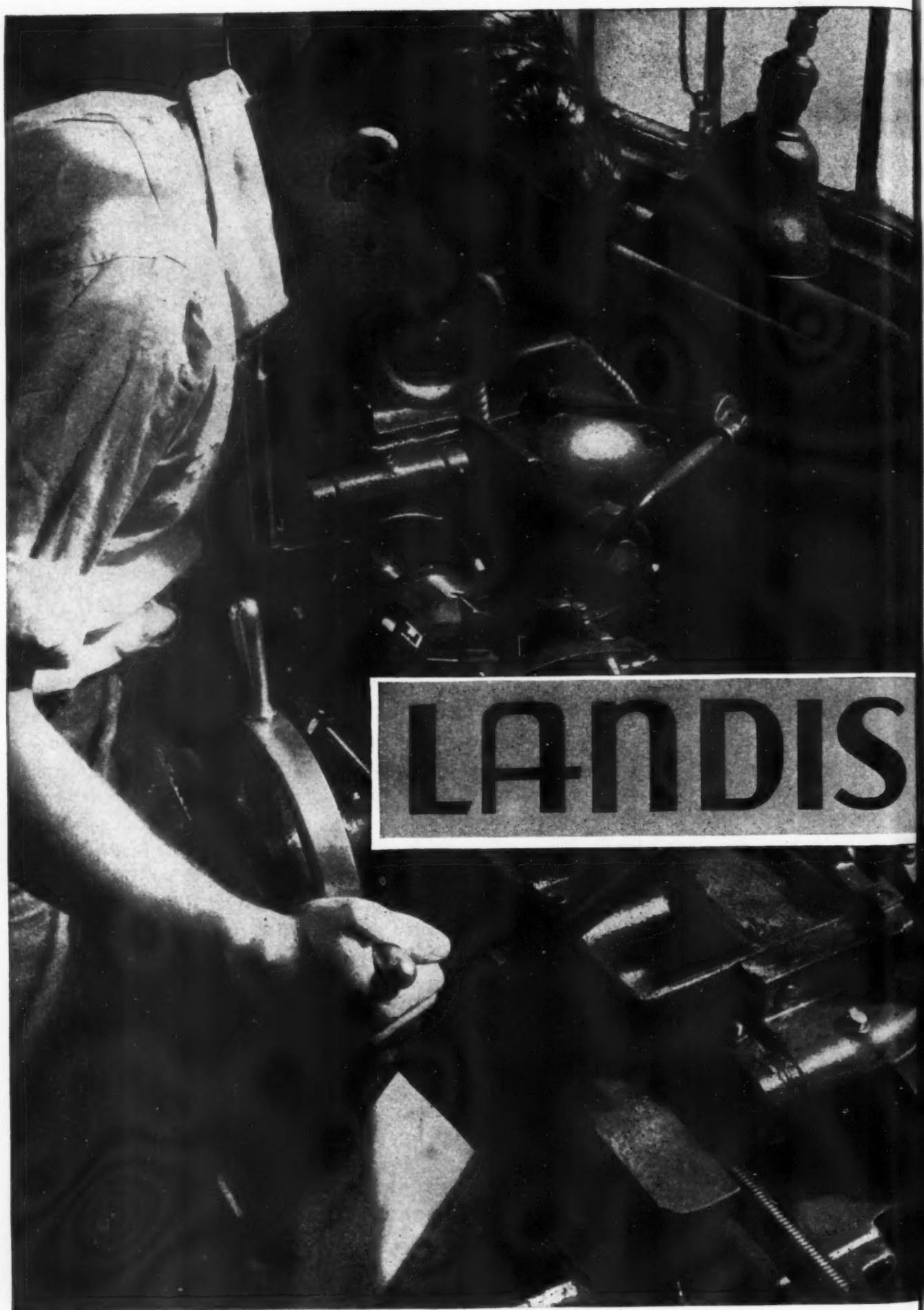
In addition, Van Norman Ram-Type Millers provide such additional advantages as front and rear control of all power and manual feeds which give operators complete control of the operation whether they are at the front or rear position. The moveable ram, in combination with the saddle movement, increases the working capacity of the machine. The sturdy heavy-duty column, knee and saddle assure rigidity for extreme accuracy. The single lever feed selector permits quick, easy selection of the proper feed required for the cutting operation. Other advantages such as large easy-to-read dials, conveniently located speed selector, rugged over-arm, 6-way rapid traverse and new heavier ram all assure accuracy, ease of operation and cost-cutting production.

Investigate Van Norman Ram-Type Millers today. See for yourself how these machines will do your work today *better* . . . and solve your milling machine reconversion problems as well.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"


LANDIS

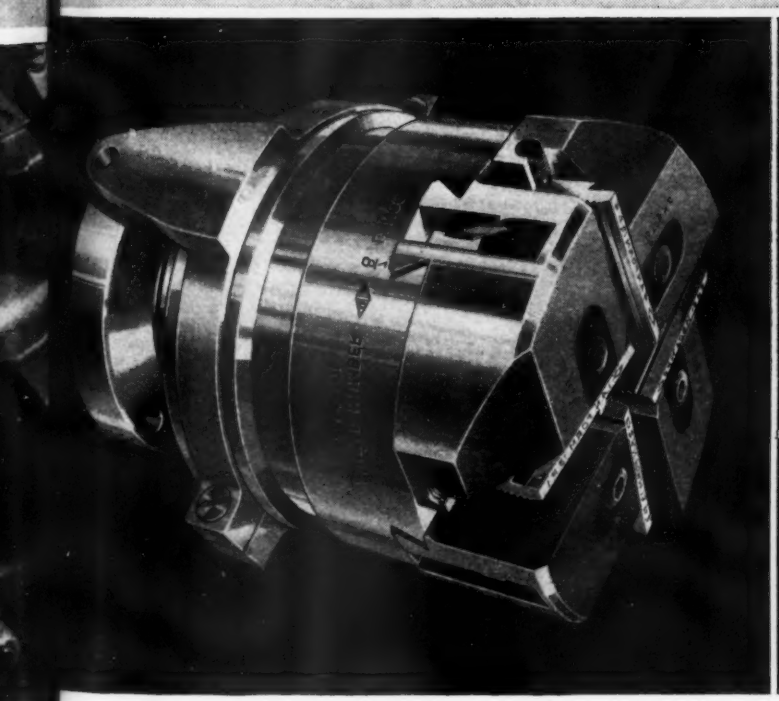
Proven in War for Peace

LANDIS THREADING MACHINES DIE HEADS AND CHASERS

Continuous operations, 24 hours a day, day in and day out, in hundreds of war plants have proven Landis Threading Machines, Die Heads and Chasers to be time savers and cost savers. In your post-war planning, Landis Threading Equipment, because of ease of operation, finer accuracy and greater production at lower maintenance cost, will be an important factor in meeting your post-war competition.

Write for Bulletin No. B-54

MACHINE CO. WAYNESBORO PENNA. U.S.A.

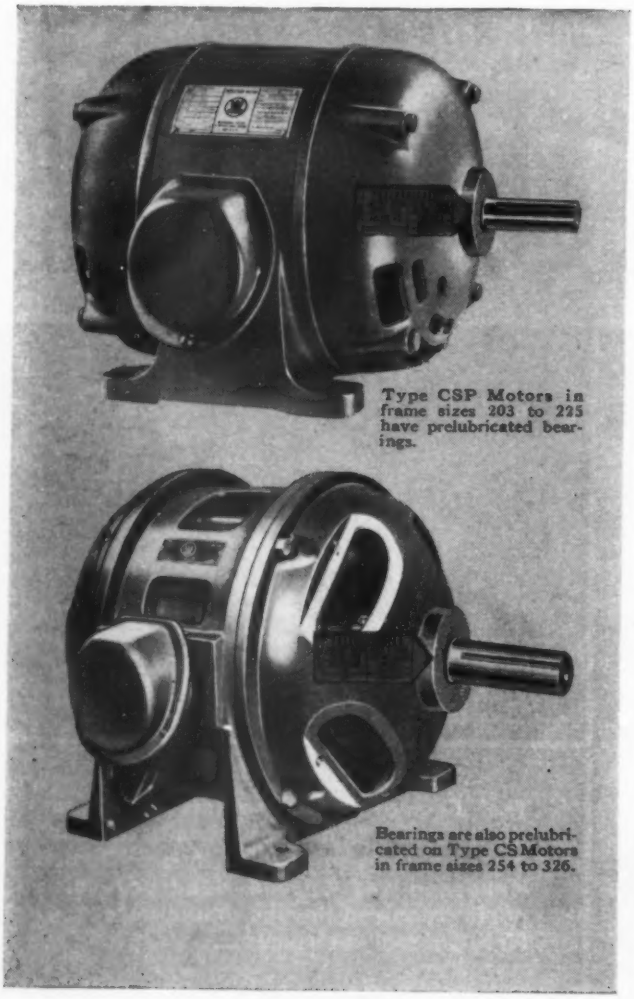


The illustration on the left-hand page shows a 7/8" single head Landis Threading Machine equipped with a 7V Lanco Hardened and Ground Head producing parts required in the manufacture of Fire Control Instruments.

with this*

you won't need this

for 5 years or more



Type CSP Motors in frame sizes 203 to 225 have prelubricated bearings.

Bearings are also prelubricated on Type CS Motors in frame sizes 254 to 326.

It's easier than ever to keep squirrel-cage motors in top running condition—now that they need no lubrication for 5 years or more. That means practically no maintenance whatever.

In sizes up to 15 hp, Types CSP and CS, frames 203 to 326, Westinghouse squirrel-cage motors now leave the factory with ball bearings prelubricated and sealed so they don't need even an inspection for 5 years or longer.

This factory prelubrication is good for 5 years or more of 24-hour-a-day operation, and it assures no overgreasing . . . no "skipped" bearings . . . no grease contamination . . . no grease seepage . . . no unreplaced pipe plugs. All these facts have been proved by on-the-job tests on machine tool applications and in busy textile mills. For further details, write for Bulletin B-3554 and Descriptive Bulletins 3100-CSP and 3100-1, to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21363

* Another Westinghouse "First"—the identification label for motors that you "Don't lubricate for 5 years or more".

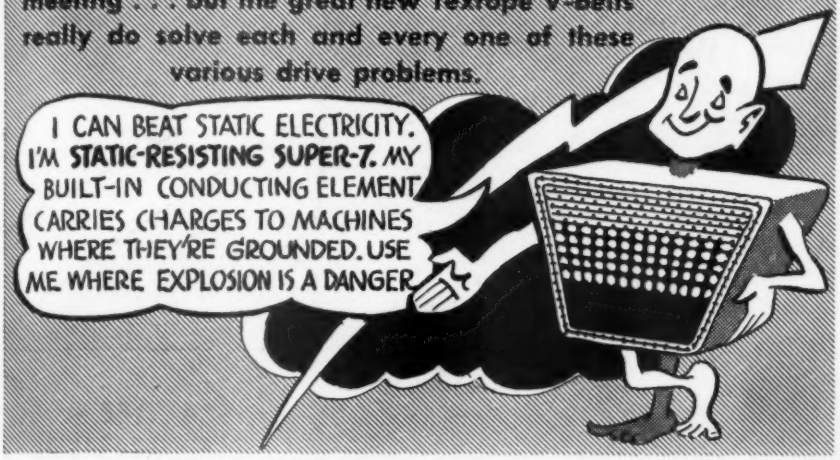
Westinghouse

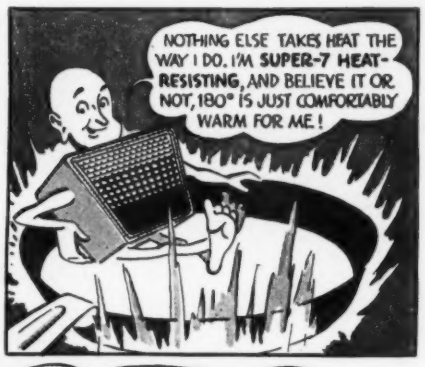
PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

SQUIRREL-CAGE MOTORS

TALL TALES ...but TRUE!

Their exploits may sound like a "Liars Club" meeting . . . but the great new Texrope V-Belts really do solve each and every one of these various drive problems.


I CAN BEAT STATIC ELECTRICITY. I'M STATIC-RESISTING SUPER-7. MY BUILT-IN CONDUCTING ELEMENT CARRIES CHARGES TO MACHINES WHERE THEY'RE GROUNDED. USE ME WHERE EXPLOSION IS A DANGER.



Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices. It pays to make Allis-Chalmers your V-belt drive headquarters.

ALLIS-CHALMERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

A 1960

BULLETIN!

SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real time-saver . . . leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 84, ALLIS-CHALMERS MFG. CO., Milwaukee 1, Wis.

ALLIS-CHALMERS MFG. CO.
Dept. 84, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

Company.....

Address.....

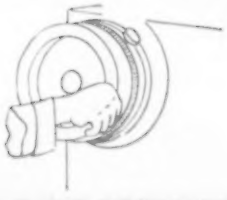
.....

Attn. of Mr.....

New BUILT-IN HYDRAULIC

4" TYPE H PLAIN HYDRAULIC GRINDER

- AUTOMATIC GRINDING CYCLES
- WHEEL RESET MECHANISM
- GROUPED ELECTRIC CONTROLS
- AUTOMATIC WORK ROTATION AND COOLANT FLOW CONTROL
- AMPLE LEG ROOM

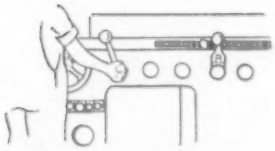


WHEEL RESET MECHANISM

for hydraulic straight infeed eliminates a very common cause of work spoilage. On the Landis Type H the wheel is automatically reset upon the conclusion of either grinding cycle, straight infeed or traverse.

ELECTRIC CONTROLS

are all conveniently grouped at the left-hand side of the bed. A master start button serves as a work jog. A master stop button provides extra safety. Conveniently located selector switches control coolant flow and work speed.



SMOOTH HYDRAULIC POWER

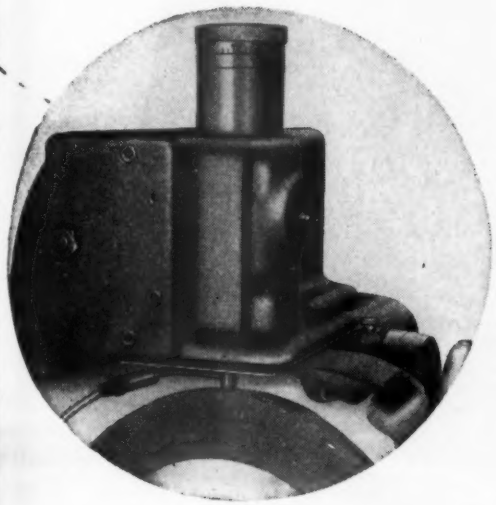
is provided by a hydraulic system powered by direct connected motor driven oil pump. T machine base forms an oil reservoir, thus savi space and making possible more compact d sign of the unit.

LANDIS TOOL *Precision Grinders*

LANDIS TOOL COMPANY WA

ICWHEEL DRESSER . . . Saves Production Time Assures Superior Finishes

IN GRINDING SMALL PARTS



This view of the new Landis Built-In Hydraulic Wheel Dresser shows the diamond in dressing position, the method of directing coolant to the diamond, and the calibrated setting for fine grinding wheel face dressing.

For superior finishes and maximum production when grinding small parts, it's essential to have a free cutting face on the grinding wheel, and that the wheel remain concentric and parallel. However, the time necessary to break the setup and dress the grinding wheel can eat a big hole in your production schedule.

To speed grinding wheel dressing and maintain superior finishes, on the Landis 4" Type H Plain Hydraulic Grinder, a new built-in, hydraulic grinding wheel dresser can be supplied. It trues and dresses the wheel at one and the same time, without breaking the setup. All the operator does is set a dial and click a switch.

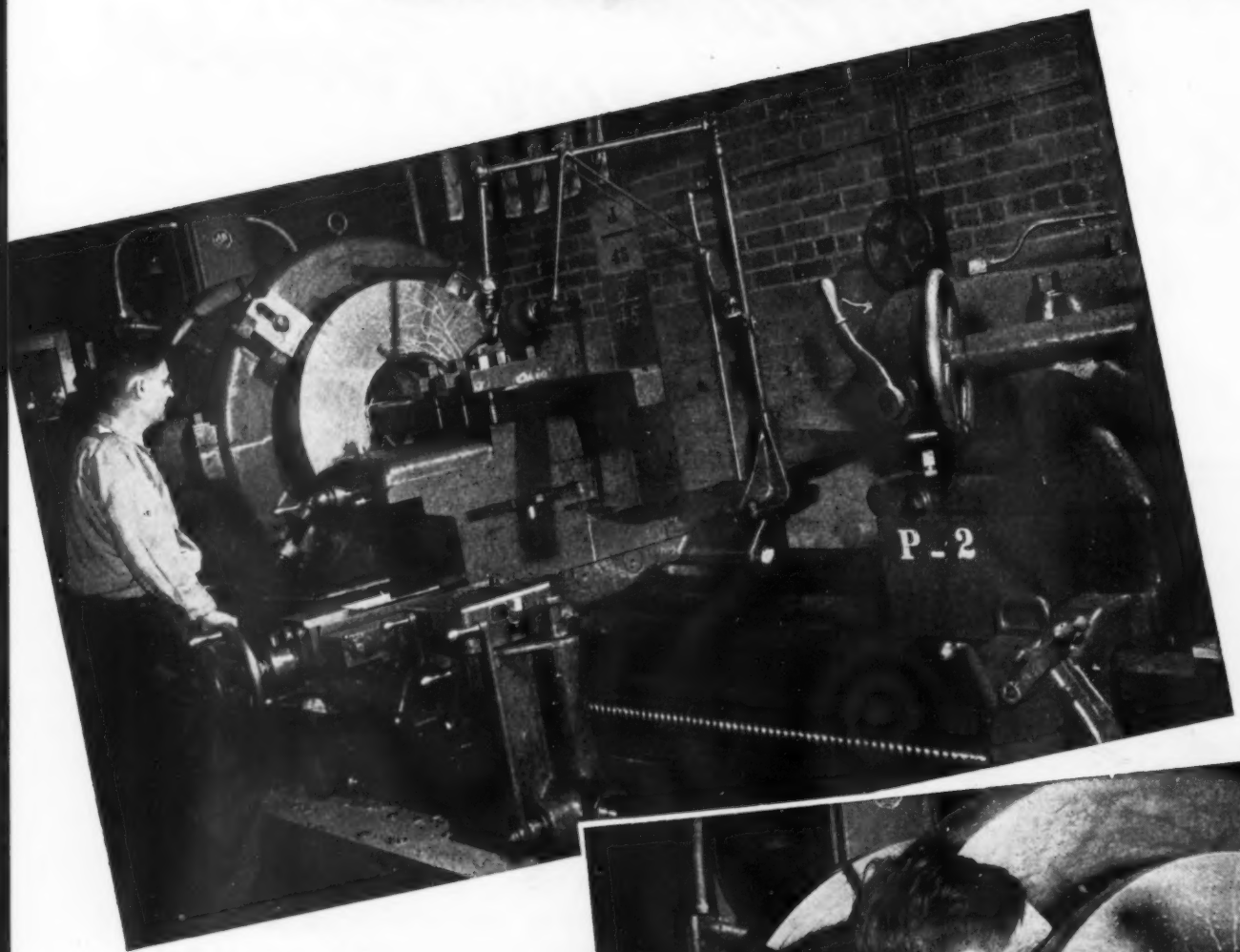
A cutting diamond traverses hydraulically across the face of the wheel and quickly sharpens it. In a matter of minutes the grinding wheel is "dressed" and true and the machine is ready for more work.

This wheel "dressing" unit is the latest addition to the long list of exclusive LANDIS TOOL features that make the LANDIS TOOL Type H so productive in turning out small parts up to 1½" with superior finishes. Other special LANDIS TOOL features of this grinding machine include, VARIABLE VOLTAGE HEADSTOCK DRIVE, MICROSPHERE WHEEL SPINDLE BEARINGS, ANNEALED CASTINGS AND DYNAMICALLY BALANCED PARTS. If you would like full details on this modern grinder, ask for your copy of Catalog A 44. 39

LANDIS TOOL Company

ANY WAYNESBORO, PENNA.

Like all True A



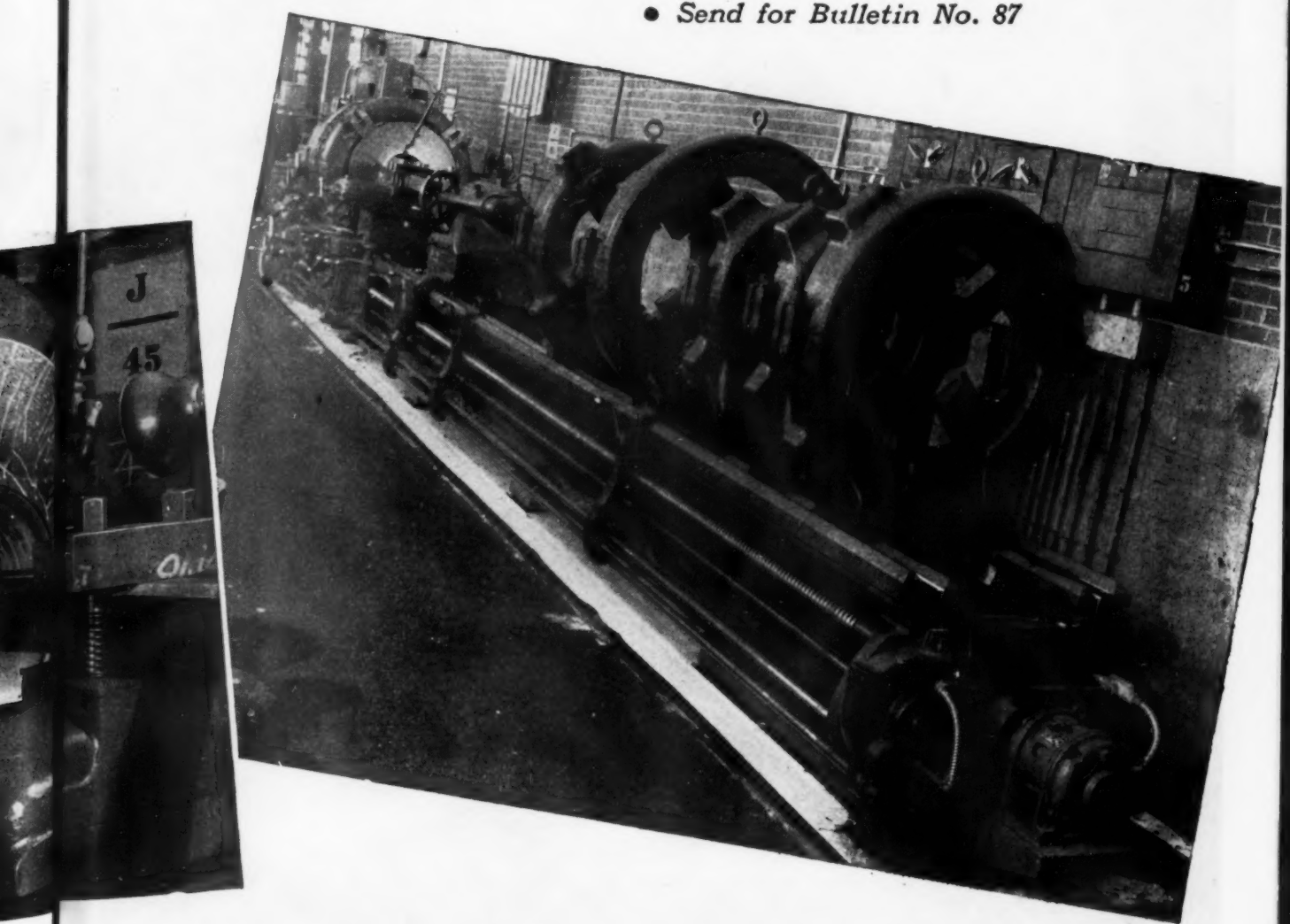
THE AMERICAN TOOL WORKS C

eAMERICANS...

"AMERICAN" Lathes, from the smallest to the largest, are meeting the challenge of production like all true Americans. The power, stamina and endurance built into "American" Lathes have proven invaluable to many a production plant operating on an around-the-clock schedule. Dependable service, minimum shut-down for failures and repairs coupled with an almost unbelievable ability to "keep going" under any and all conditions are genuine "American" characteristics. "American" Lathes are easy to operate, too—another feature that appeals to the operator as do their simplicitv of design and complete freedom from complex mechanisms and manipulations.

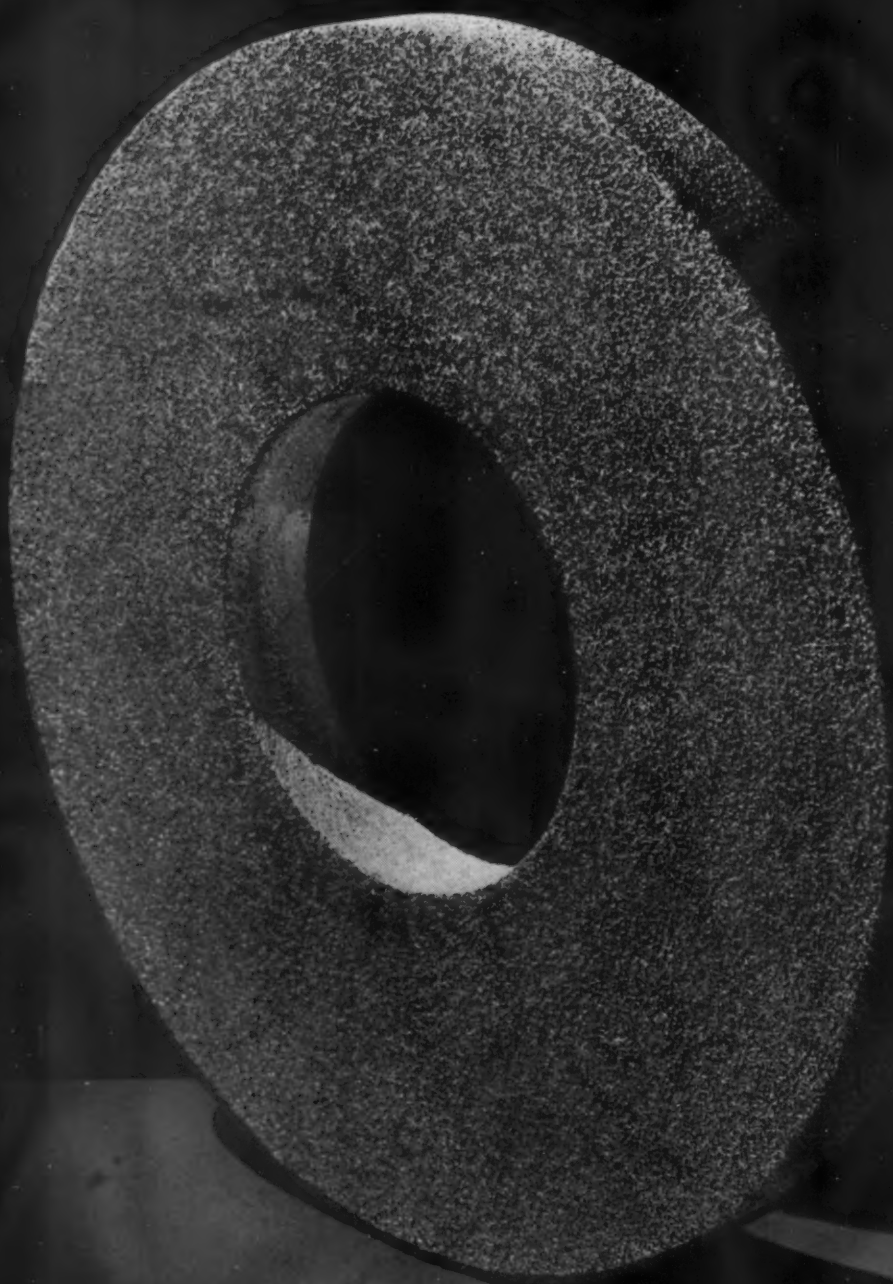
"American" Lathes are an asset in any plant.

• *Send for Bulletin No. 87*



c Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

Something *New* in a



Resinoid Wheel for Foundry Grinding

B-5 is the designation for a new and improved Norton resinoid bond for wheels in the soft and medium hard range. In foundry after foundry it is proving exceptionally good for grinding steel and soft malleable iron castings and forgings. On weld grinding jobs it does a quick, clean job of removing the bead.

Operators like the fast, smooth cutting action of the Norton B-5 Resinoid Wheel and the way it hugs the work. Management likes the way it cuts costs—because of its faster grinding action and longer life.

It will definitely pay you to try the Norton B-5. Get in touch with your Norton abrasive engineer or Norton distributor.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in All Principal Cities

W-1026

Here's What They Say

About B-5 Resinoid

"Best wheel ever used. Castings ground in half of normal time." (A123-04B5 grinding steel castings on floor stand)

"Doing a splendid job. Life 80 hours compared to 60 for previous wheel." (A123-Q4B5 grinding manganese steel castings on swing frame)

"Most outstanding wheel ever in the plant—twice the work and almost twice the life of competing wheel." (A142-P4B5 grinding steel castings on floor stand)

"Cut faster and gave better finish than previous wheel." (57A20-M4B5 grinding welds using portable grinder)

"Very satisfactory for both cutting action and life." (37C24-P4B5, No. 12 treated, grinding aluminum and magnesium castings on floor stand)

NORTON ABRASIVES

COMPARE THIS
New Monarch.....
All electric drive, providing 100 to 1 range of gearless, stepless spindle speeds, forward or reverse up to 6000 rpm or higher.
Flame-hardened and ground bedways and carriage "V" —65° acute angle for accurate alignment.
Bench precision accuracy with flexibility and ease of handling from operator sitting or standing position.
Totally enclosed gear box, providing six gear changes; electric furnace hardened with ground or shaved gears.

The new Monarch 10″ Precision Manufacturing Machine. 3 hp motor gives spindle speeds up to 6,000 rpm. Swing over bed, 12½″; swing over cross slide, 7¼″; distance between centers, 20″. For full details, ask for Bulletin No. 10 M.

with your OLD turning machines

While only recently being generally offered to American industry, this new Monarch 10″ Precision Manufacturing Machine has for almost two years demonstrated its value for fast, remarkably accurate turning of parts within its size range. Its time and cost-saving abilities have been completely proved on the most highly critical aircraft production.

Even with quickly-trained operators with no previous lathe experience, the quality, quantity and accuracy of its work have met the most strict military requirements.

It combines the bench-precision qualities of Monarch's Toolmaker's Lathes with the high-speed production of the larger size Monarch machines. Even at speeds as high as 6,000 rpm it is remarkably free from vibration, and it is fully adaptable to the use of carbide cutting tools.

Ask for details

Our Bulletin No. 10 M gives complete information and specifications, and will be mailed on request. Or, if you wish, our engineers will gladly analyze your work and help you to utilize the many advantages of the Monarch 10″ Precision Manufacturing Machine. If your reconversion needs cannot be met by our present deliveries, we'll gladly try to assist you in the selection of Monarchs from government surplus stocks. Address us at Sidney, Ohio, or at our nearest branch office.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

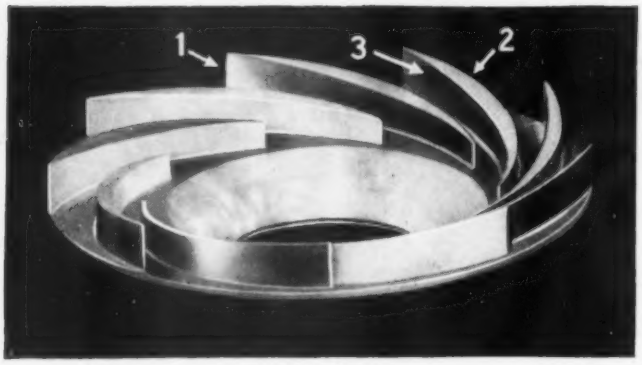
INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

THREE *Snyder* SPECIALS *for* MILLING DIFFUSER PART



One of the chief objectives in creating these three special milling machines was to reduce to a minimum the need for costly, time-consuming hand finishing operations on an aircraft diffuser part.

First operation uses a vertical, two-spindle, end-milling machine to mill a 1/32" radius on each end of the nine diffuser vanes. End mills are installed on eccentrically mounted quill housings which rotate through nearly 180°. Two-spindle head, motor and drive mechanism slide into position hydraulically, supported by two guide bars. Part is clamped on nine-station Geneva index table. This machine is essentially a Snyder 3 v 14 drilling machine with special equipment.

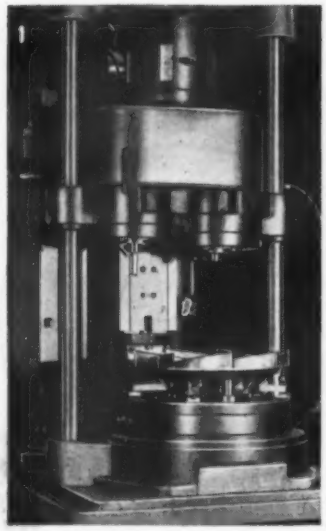
Second operation uses a vertical, single-spindle miller with side milling cutters set on an angle to the vertical center line. Besides feeding the cutter down, moving the entire slide in and out and rotating the table at feed rate, it also is necessary to keep the cutting edge of the milling cutters tangent to the various radii which make the contour of the vanes. Therefore it was necessary to rotate the spindle housing angularly in correspondence to the in-and-out movement of the main slide. This operation is completed in nine passes.

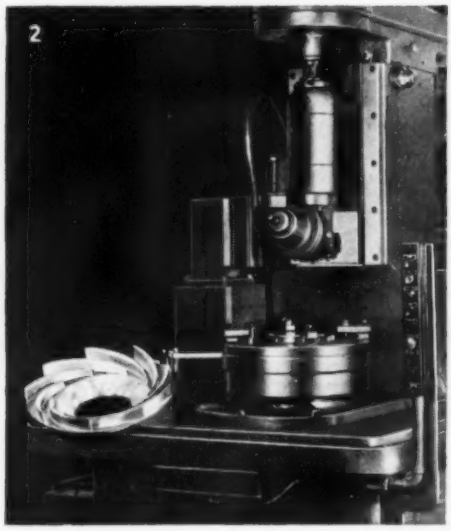
Third operation uses a vertical, single-spindle end mill in which the housing follows the contour of the part by cam action. Part is rotated at feed rate through an arc while the vertically feeding spindle housing is moved in and out through cam action. All three actions of the feed mechanism—feeding cutter up and down, moving in and out and rotating the part—are mechanically synchronized.

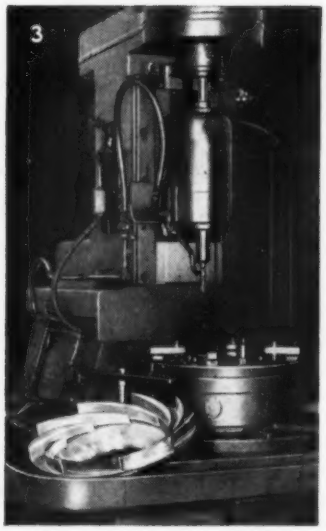
On the basis of time and money saved, these machines are an excellent investment. Perhaps there are opportunities for similar savings in your present or prospective production program. We invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

20 Years of Successful Co-operation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

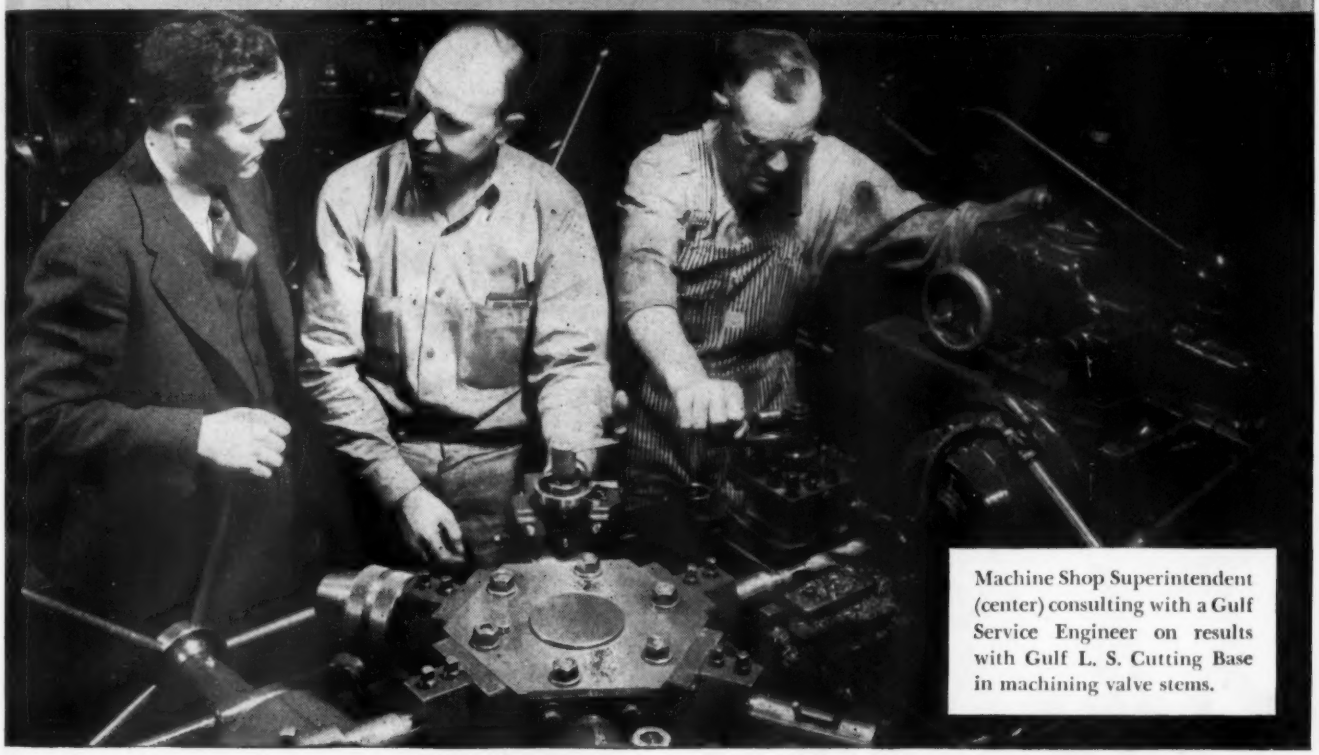






"With GULF CUTTING OILS we get greater production, longer tool life, and better finishes"

says this Superintendent



Machine Shop Superintendent (center) consulting with a Gulf Service Engineer on results with Gulf L. S. Cutting Base in machining valve stems.

"AFTER SWITCHING to Gulf Cutting Oils, we noted a general improvement all over the shop in production, tool life, and finish," says this Superintendent. "By the use of Gulf L. S. Cutting Base on this machine, we increased output about 40 per cent, and in addition secured longer tool life and a much better finish on the work."

Gulf quality cutting oils can give you a vital advantage in machining efficiency that may help you make substantial cuts in unit production costs. Here's the important reason: Every Gulf Cutting Oil has specific properties which insure better performance on certain types of machining jobs!

It will pay you to find out quickly the full possibilities of Gulf's production-proven cutting oils in your shop. Call in a Gulf Service Engineer today and let him show you how they can help you with your machining problems. Write, wire, or phone your nearest Gulf office. For your copy of the booklet "Gulf Cutting Oils," send the coupon below.

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3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

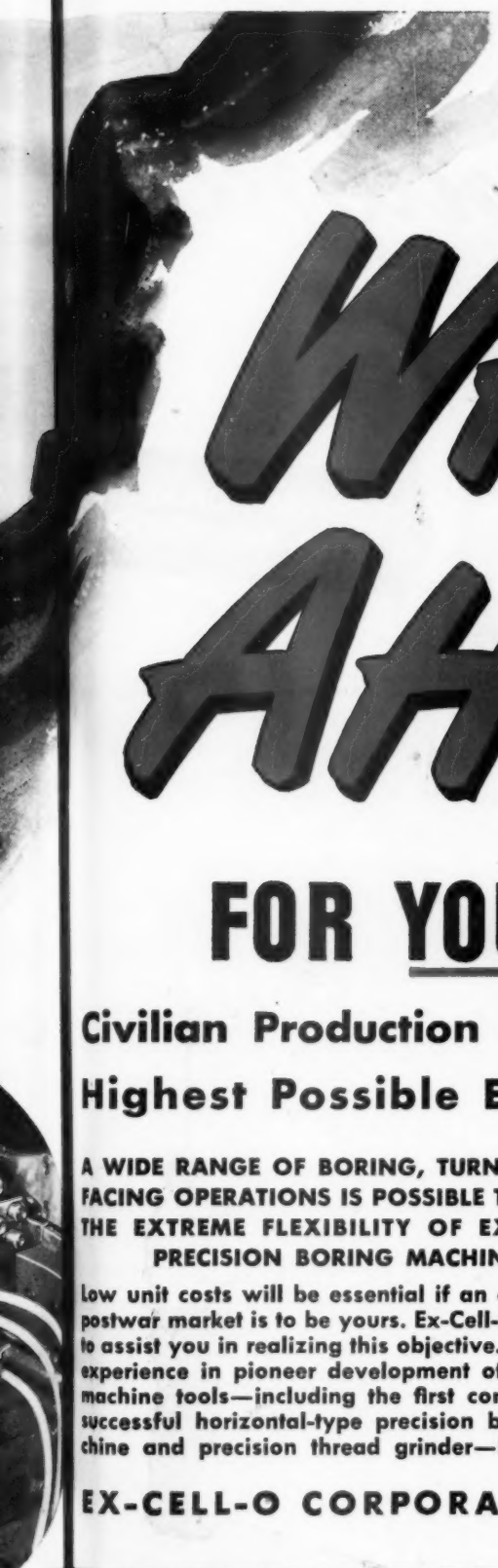
Name.....

Company.....

Title.....

Address.....

To right: **Illustrated here is an Ex-Cell-O Junior Single-End Precision Boring Machine (Style 2112-A) with bronze parts bored, faced, turned and recessed on it. The parts are two mating halves of a metering chamber. The front spindle carries the bottom half of the part and the rear spindle carries the top half of the part. One cycle of the machine completely finishes all internal surfaces—boring, facing, turning, and recessing (3 bores, 5 faces, turn one diameter, recess mating diameters). Both halves are machined simultaneously. By machining all internal surfaces and the mating surfaces at the same time, complete concentricity and accurate mating of the two halves are insured. After the two halves are assembled, the measuring chamber is then turned on the O.D. on another Ex-Cell-O Style 2112-A Precision Boring Machine.**



WHAT'S AHEAD

FOR YOUR BUSINESS?

Civilian Production Also Demands Equipment of the Highest Possible Efficiency—*See Ex-Cell-O First!*

A WIDE RANGE OF BORING, TURNING AND FACING OPERATIONS IS POSSIBLE THROUGH THE EXTREME FLEXIBILITY OF EX-CELL-O PRECISION BORING MACHINES

Low unit costs will be essential if an expanding postwar market is to be yours. Ex-Cell-O is ready to assist you in realizing this objective. Ex-Cell-O experience in pioneer development of precision machine tools—including the first commercially successful horizontal-type precision boring machine and precision thread grinder—is at your service. Whether your peacetime production plans involve standard or special machines, re-tooling, cutting tools, or miscellaneous production parts, you should decide now to *see Ex-Cell-O!* Contact the Ex-Cell-O head office in Detroit, or any of the Ex-Cell-O representatives stationed in 32 other leading industrial centers throughout the United States and also in Canada.

Where increased production, high accuracy, and greater economy through multiple operations are required . . . See EX-CELL-O First!

EX-CELL-O CORPORATION · DETROIT 6

Standard and Special Multiple Way-Type Precision Boring Machines

•

Continental Cutting Tools

Precision Thread Grinding Machines

•

Precision Lapping Machines

•

Broaches and Broach Sharpening Machines

Multiple Drilling and Other Special Purpose Machines

•

Tool Grinders

•

Hydraulic Power Units

Grinding Spindles

•

Drill Jig Bushings

•

Aircraft and Miscellaneous Production Parts

Fuel Injection Equipment

•

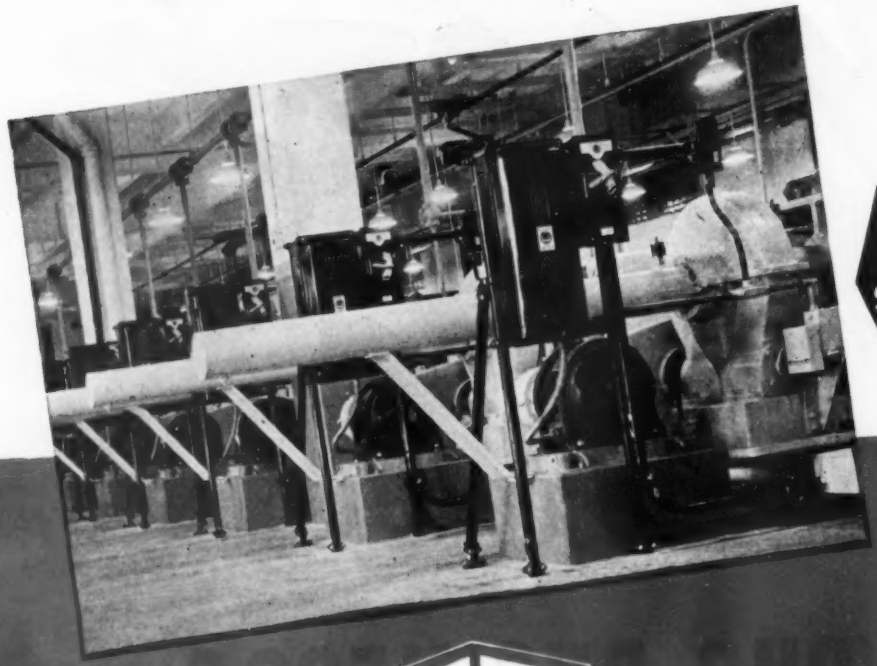
R.R. Pins and Bushings

•

Pure-Pak Paper Milk Bottle Machines

45—94

Added Convenience



CONVENTIONAL STARTER MOUNTING

CENTRALIZED CONTROL CENTER

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

. . . through Centralized Motor Control

Easy to install, operate and maintain . . . provides complete flexibility . . . permits easy modification with plant changes

Hundreds of industrial plants have proved the economy and expediency of centralized motor control. Instead of placing a control unit at each motor, the Control Center places them all at one location. Installation and wiring is simplified, and over-all installation costs reduced.

In addition, Westinghouse Control Centers offer these advantages that provide complete flexibility:

All structures free standing.

All vertical structures 20 inches wide by 20 inches deep, regardless of whether starters are mounted on one side only or on both sides of structure.

All starter units, sizes 1 to 4, inclusive, 20 inches wide by 14 inches high or multiples of 14 inches high.

All incoming and outgoing connections accessible from front.

For complete information about the advantages of Westinghouse Control Centers, ask your Westinghouse office for B-3026. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60625

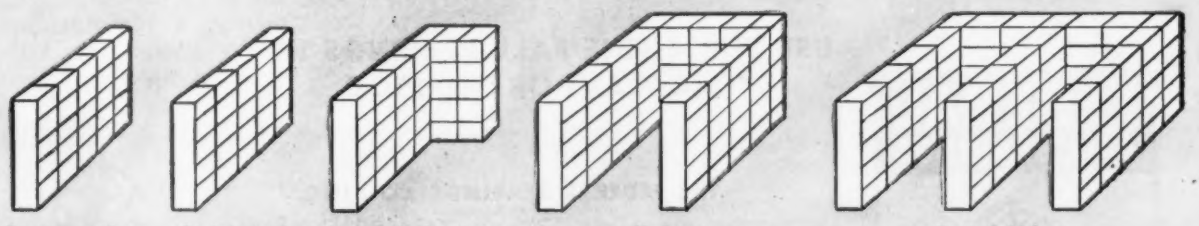
Three Types of Wiring Available in Westinghouse Control Centers

1. Line connections only made at factory.

2. Motor and control connections factory wired to an individual terminal board in each compartment.

3. All outgoing connections factory wired to a common master terminal board which may be located at top or bottom of structure, depending on customers' preference.

TYPICAL ARRANGEMENTS POSSIBLE WITH WESTINGHOUSE CONTROL CENTERS



CONTROL CENTERS

LOAD CAPACITY OF 2 SINGLE ROW BEARINGS COMBINED IN ONE UNIT

Federal Double Row bearings are another example of Federal skill in the manufacture of fine ball bearings. Federal Double Row bearings hold the shaft rigid and perform with equal efficiency if shaft is slightly out of alignment. Federal Double Row bearings carry a heavy load and absorb overloads and side-thrusts with greater economy of space.

Federal Double Row bearings are giants in strength, gluttons for punishment and contribute to the frictionless performance of heavy machinery in hundreds of different industries.

USE THESE FINE BALL BEARINGS IN YOUR PLANT OR PRODUCT

FEDERAL
BALL BEARINGS
THE JEWELS OF INDUSTRY

THE FEDERAL BEARINGS CO., INC.

Makers of Fine Ball Bearings

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

Detroit: 2640 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

It is reported that . . . . . .

"Liquid Envelope" is the new commercial coating that has been used to protect fighter planes in shipment. It may be sprayed, dipped or brushed, hot or cold. *Better Finishes & Coatings, Inc., Newark, New Jersey.*

get ready with CONE for tomorrow

Three iron companies are cooperating in a joint photographic aerial survey of the Marquette Range as an aid to more detailed exploration. *Engineering & Mining Journal.*

get ready with CONE for tomorrow

A new electrical instrument is said to be so sensitive that it can measure movements as small as one ten-millionth of an inch without touching the object. *Battelle Memorial Institute.*

get ready with CONE for tomorrow

A scientific journal reports that a new type of mechanical refrigerator, employing a high-speed rotor as its only moving part, can produce temperature drops as great as 220 degrees and can, by modification, be used as a heat pump for such purposes as the heating of homes in winter. *Journal of Applied Physics.*

get ready with CONE for tomorrow

Stainless steel is being made for a black surface finish suitable for the bottoms of cooking utensils and for many applications where reflections or glaring light are a disadvantage. *Business Week.*

get ready with CONE for tomorrow

The announcement by one radio manufacturer of a new set not much larger than a package of cigarettes is expected to be followed by a rush of similar announcements by other manufacturers. *Sentinel.*

get ready with CONE for tomorrow

Prisoners of war are constructing a model of the Mississippi River drainage area to permit the study of complex problems of drainage for the co-ordination of flood control measures. *Engineering News Record.*

The Great Lakes Research Institute has been organized to do for these inland seas what the Woods Hole Oceanographic Institute has been doing for the Atlantic.

get ready with CONE for tomorrow

The Army is packing guns and other weapons and surplus material in steel or aluminum "cans", in an atmosphere of nitrogen, for storage. *Air Technical Service Command.*

get ready with CONE for tomorrow

Stainless steel can now be cut with an oxy-acetylene torch almost as easily as mild steel. *Air Reduction Sales Co., Rustless Iron & Steel Corp.*

To aid the war-to-peace reconversion of scientific research, the Senate's subcommittee on war mobilization recommends that Congress create a National Science Foundation as an independent government agency.

get ready with CONE for tomorrow

Power steering, which has been discussed speculatively for automobiles, is being used on one model of dump truck. *Heil Co.*

get ready with CONE for tomorrow

America's first jet-propelled plane is now a museum piece at the Smithsonian Institution. *Science News Letter.*

get ready with CONE for tomorrow

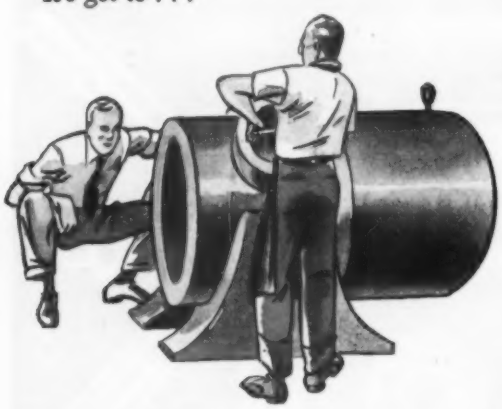
A new portable hardness-testing hammer is spring-operated and, being portable, can be used to test pieces of metal of any size, anywhere. *Steel City Testing Laboratory, Detroit.*

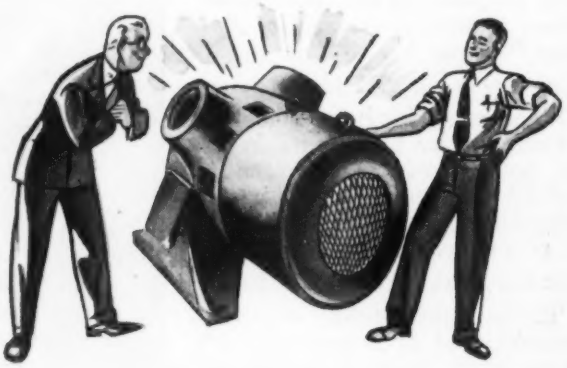
"So They Dumped an 1800 lb. Compressor in Our Lap!"

"It's Yours, Old Man," said the Sullivan Machinery Co. to the Allis-Chalmers engineer. "All that compressor needs to make it happy is a motor. But it's got to have the right qualifications before it can keep company with my machine!"

"I Don't Want This! Looks like the motors in San Francisco and the compressor's in New York. What I want is a motor that'll hug that compressor so close you can't tell where one starts and the other ends. It's got to . . ."

Well, That Compressor Manufacturer made our heads whirl. Lighter . . . more compact . . . simple design . . . rugged construction . . . trouble-free . . . these were only part of what he wanted. So we measured and figured and made designs . . .





We Cut Overall Size by pressing the rotor on the compressor shaft. That eliminated motor bearings and with it lubrication worries and any chance of misalignment. A new type of housing reduced weight, helped pack more hp into less space.

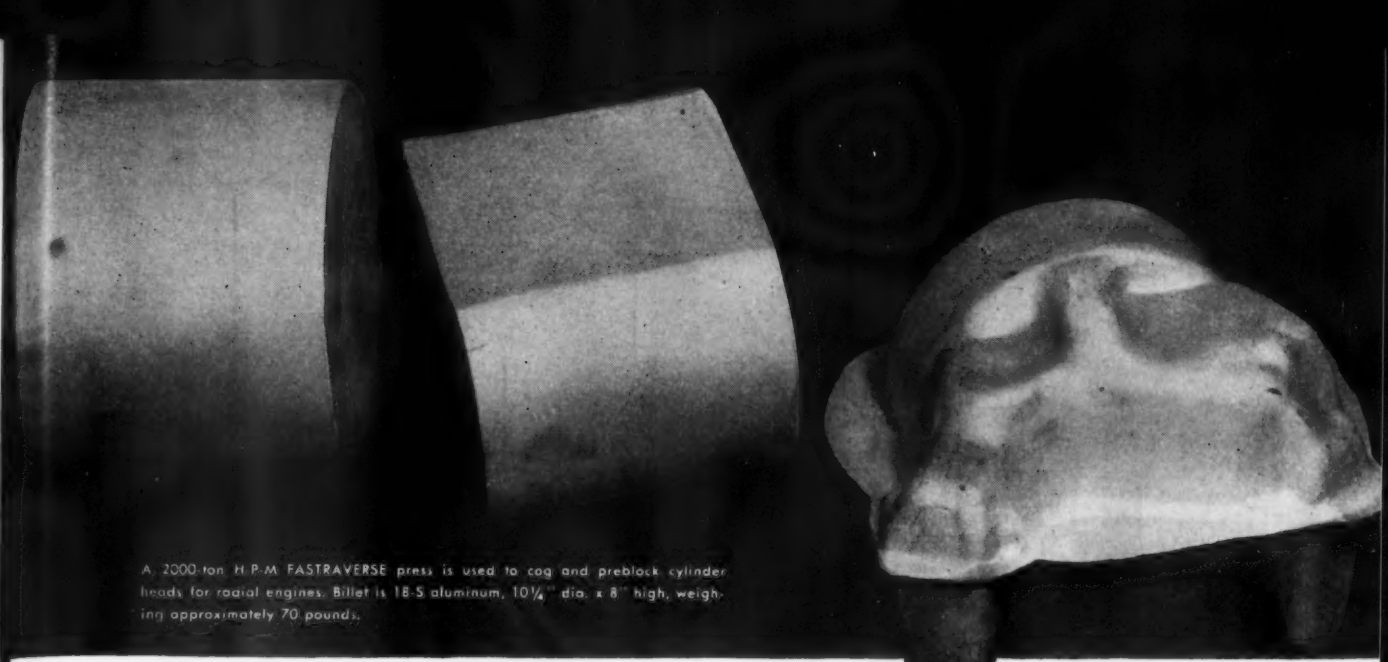
Result: A completely integrated package unit with a mighty saving in space. To install it you only had to connect the leads and it began to purr. Speaking of purring — you should have heard Mr. Compressor Builder when he saw the finished product.

A 1926

There's a Moral: Every time Allis-Chalmers engineering solves *special* motor problems, we discover new ways to build better standard motors for you. Watch for these new and better motors from A-C.

Wait 'til you see the NEW ALLIS-CHALMERS MOTORS!

HEAR THE BOSTON SYMPHONY: *Every Saturday Evening, American Broadcasting Co.*



A 2000-ton H-P-M FASTRAVERSE press is used to cog and preblock cylinder heads for radial engines. Billet is 18-S aluminum, 10¼" dia. x 8" high, weighing approximately 70 pounds.

Look at the metal you can move with each stroke of the H·P·M FORGING PRESS!

Actual production results in forging aluminum parts prove that H-P-M All-Hydraulic Forging Presses will out-produce drop hammers 2 to 1. Normally 5 to 10 hammer blows are required to obtain the same amount of metal movement that can be secured with a single press stroke. Die life has been increased as much as twenty times. Scrap losses have been held down to less than 0.1 percent. Relatively unskilled help can be employed to operate H-P-M presses, and forging crews need not be spelled off. The structure, grain flow and strength of hydraulic press forgings compare equally with those produced in impact forging machines. Investigate H-P-M presses for your forging requirements. You can forge it faster and cheaper with an H-P-M press.

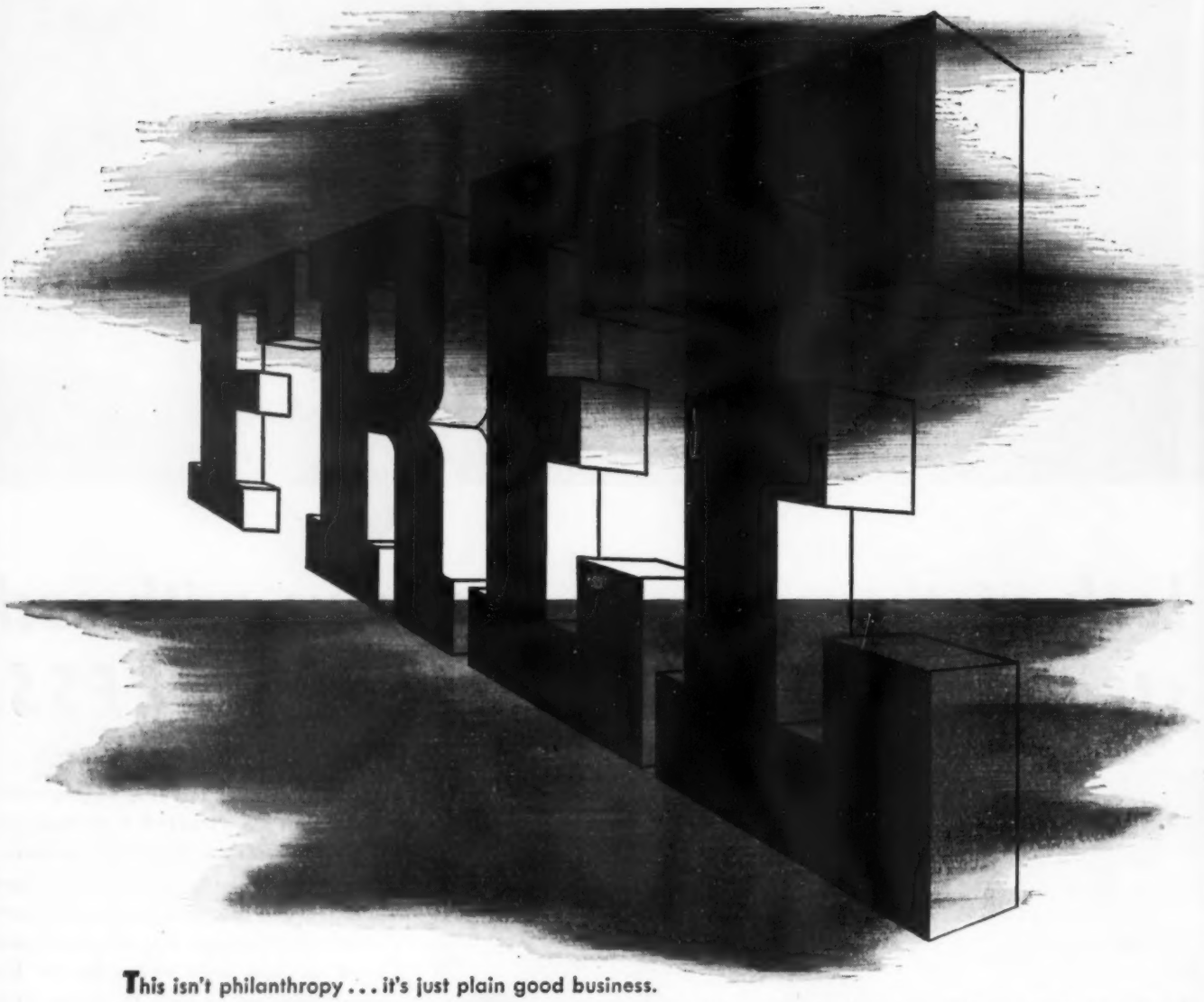
THE HYDRAULIC PRESS MFG. CO.
MOUNT GILEAD, OHIO, U.S.A.
Branch Offices in New York, Philadelphia, Cleveland, Detroit & Chicago. Representatives in principal cities.

HPM

REVOLUTIONIZING PRODUCTION

All-Hydraulic Fastraverse
FORGING PRESSES

WITH HYDRAULICS SINCE 1877



This isn't philanthropy . . . it's just plain good business.

We're in a position today to offer a very special service to American industry, and as a result, we in turn should stand to benefit from it.

The facts are these:

Exclusive of government-owned machinery, 54 per cent of installed metal-working equipment in the United States is over 10 years old, and a huge percentage of *all* equipment has been driven far beyond its limits of efficiency.

In short, "the metal-working plants of the U. S. are not as well off today from the standpoint of modernization as they were at the start of the depression in 1930* . . . and we are entering the most highly competitive manufacturing era of all time!"

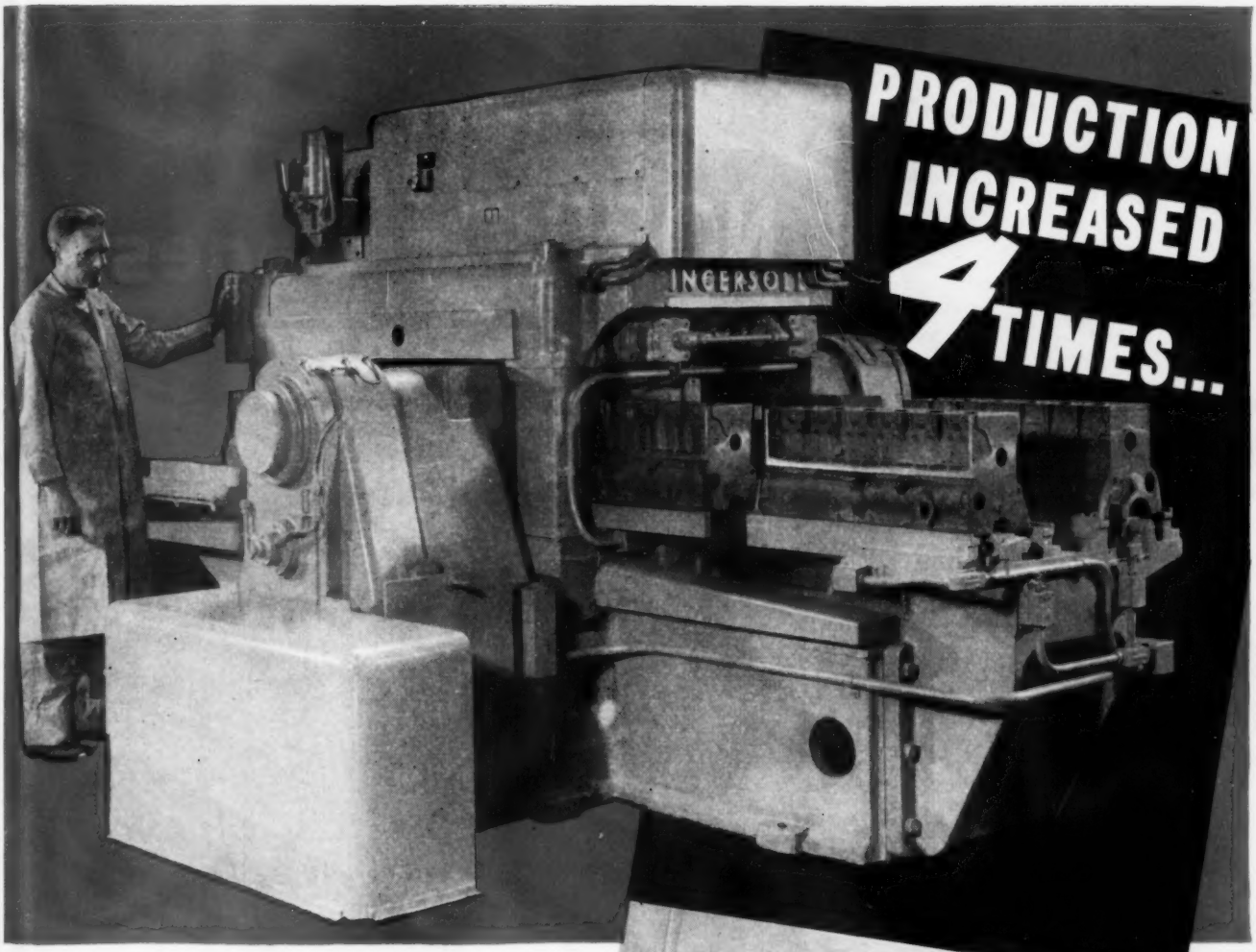
In view of this critical situation, the service we're offering manufacturers today consists of *first* . . . assistance to you in appraising the cost efficiency of your internal grinding machines against that of the best available War Surplus machines, or new machines. And *second* . . . assistance to you in cutting costs on internal grinding operations by the application of the most advanced data and knowledge available in our basic specialized field of internal grinding.

Send for the Man from Bryant

*American Machinist inventory of metal-working equipment, Bulletin 1450.

BRYANT BRYANT **CHUCKING GRINDER COMPANY**

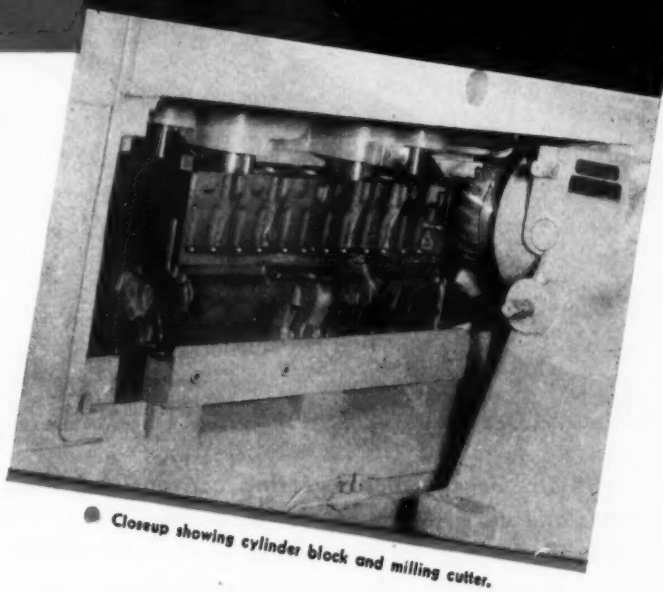
SPRINGFIELD, VERMONT, U. S. A.



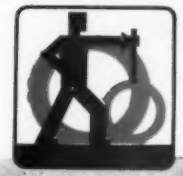
● Valve cover pads for automobile engine blocks are milled two at a time on this special 2-spindle Ingersoll at the rate of 100 per hour.

The operator positions 2 blocks, side by side, at the loading station. The blocks are automatically clamped, fed through the milling cutters, and ejected at the back of the machine.

Besides increasing production 4 times over the old methods, power clamping and transferring of the cylinder blocks greatly decreases the work of the operator.



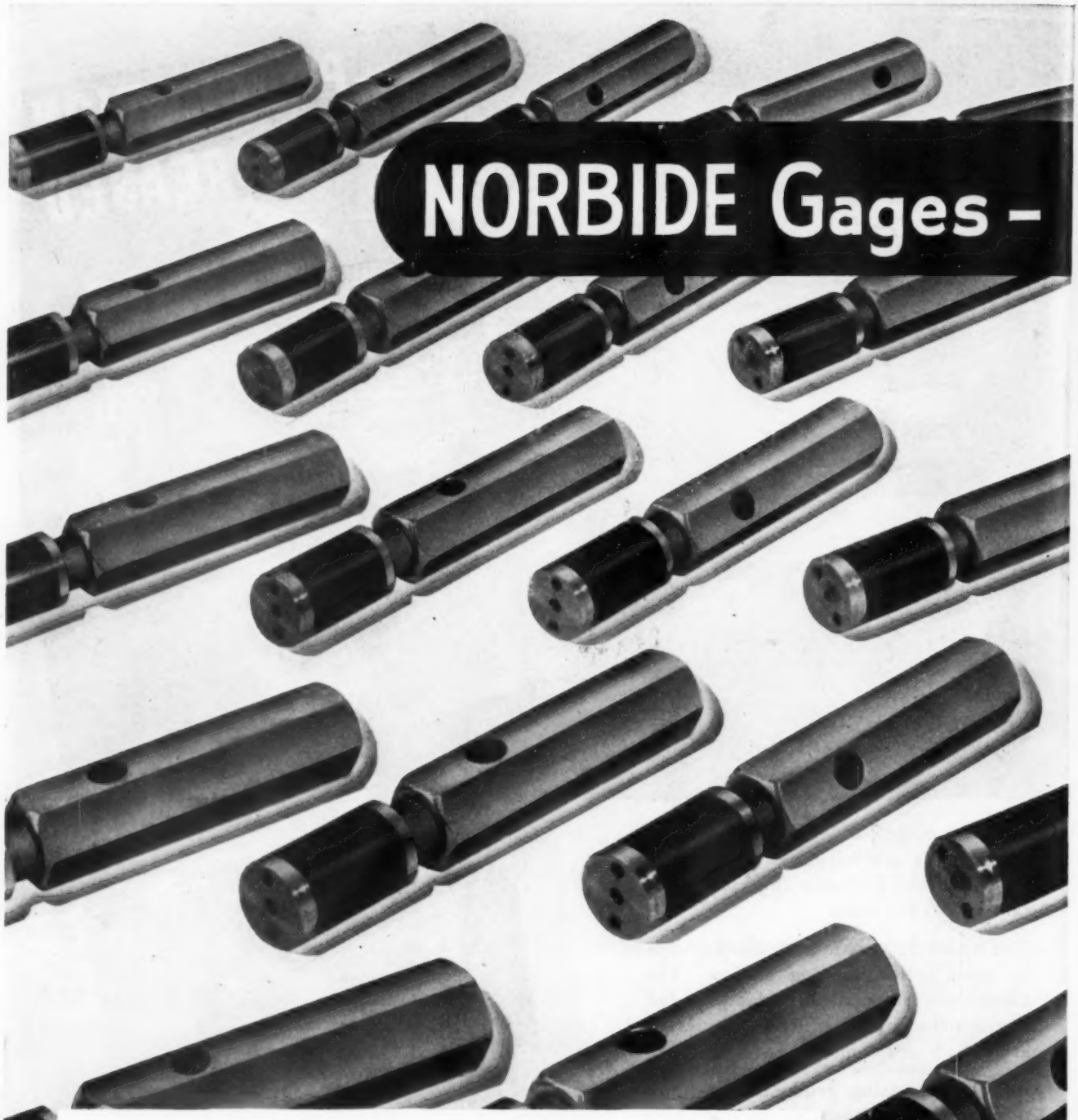
● Closeup showing cylinder block and milling cutter.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

INGERSOLL

SPECIALIZED MILLING, DRILLING, BORING, TAPPING, SCALPING MACHINES

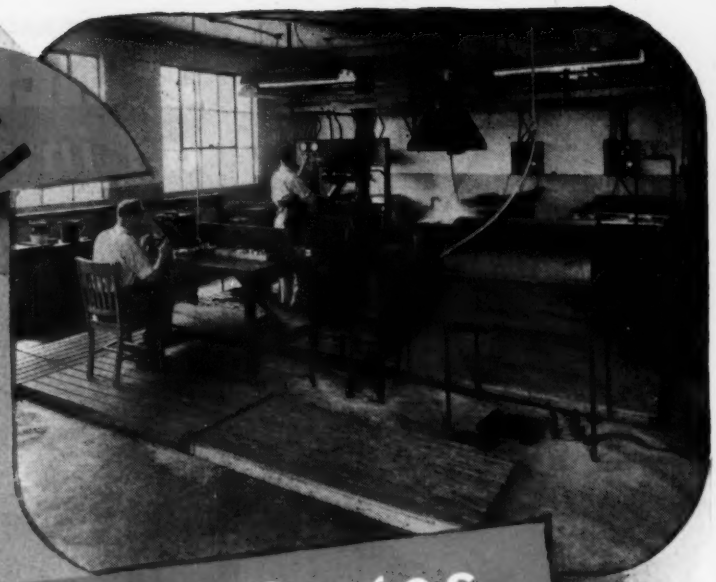


NORBIDE Gages are outwearing conventional measuring devices 200 times and more. Made of Norton Boron Carbide — "the hardest material made by man for commercial use" — NORBIDE Gages show exceptional resistance to abrasion and scratching. They will not pick up lint nor become charged with particles of metal and they are inert to chemicals employed where gages are used. NORBIDE blanks for plug, ring, snap and keyway gages and NORBIDE contact points for dial indicator gages can be obtained from your regular gage supplier. For an interesting booklet on NORBIDE Gages write for Catalog #1100 to:

NORTON COMPANY - WORCESTER 6, MASS.

NORBIDE is a Registered Trade-mark

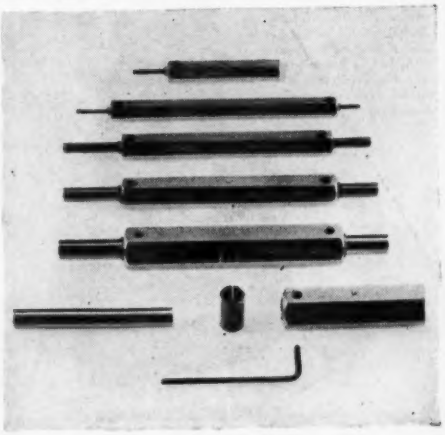
Van Keuren



PRECISION CHROMIUM PLATING applied to Plug Gages

THE Van Keuren Co. has developed a new method of precision chromium plating of wire type and taper insert plug gages. In this modern plant we have combined the best available plating practice with the ability to make precision measurements. We are able to deposit a chromium wear surface accurate to a few millionths of an inch. Gages are finished to the low wear limit and then are plated to the high wear limit. The result is a thin, closely adhering wear surface which will not crack or peel and which is available at a very moderate cost.

Instead of paying 50 to 75% additional for chromium-plated gages, they are now available for only 25% additional and they wear 3 to 5 times as long as steel gages. The many repeat orders which we are getting from large users indicate that this new method is resulting in more prompt deliveries, greater wear, lower gage cost, and satisfied customers. For your next gaging job, specify Van Keuren chrome-plated gages.



Handbook and Catalog No. 33.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles.

SCHERR Tools to SEE with

SCHERR MAGNI-RAY
an invaluable inspection tool

It makes SEEING easy — because it not only magnifies the work under inspection, but also floodlights it with powerful rays of light shielded from the eyes of the operator.

It gives true vision — the immense advantage of two-eye seeing (three-dimensional vision). The lens is ground by experts to avoid all distortion.

Thousands of Magni-rays are serving many large inspection departments today. Thousands more are individually serving on precision machines or critical toolroom operations.

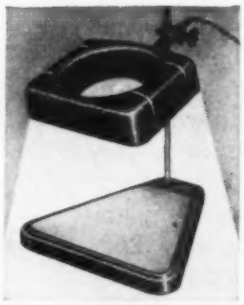
Heavy base permits of swinging the lens to any convenient position, at any height within 14 inches. Lens frame can be quickly removed from base and held in hand for inspecting surfaces on large objects.

MODEL A has 3 in. diameter optical glass lens, 1½ x plus (depending on focusing). The most popular type for general inspection. Complete with two bulbs, cord and switch, swiveling clamp and stand — $18.50.

MODEL B achromatic lens magnification power of 3 plus. Complete, $27.50.

MODEL C for larger work, has 5 in. optical glass lens of 1½ x plus. Handle on Magni-Ray unit for convenience in holding it in the hand, detached from the base by quick-release swiveling clamp. Complete, $33.00.

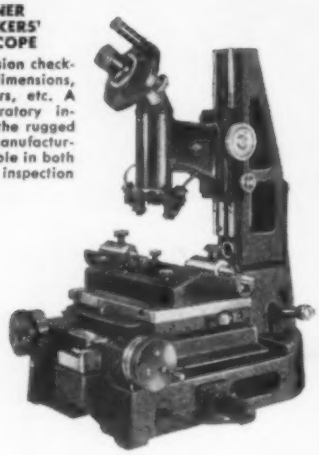
If in doubt, try one Magni-Ray — and learn why this seeing tool is so commonly seen in so many shops. Shipment at once. Further details on request.



The Model C Magni-Ray

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific laboratory instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department.



SCHERR BORE INSPECTOSCOPE

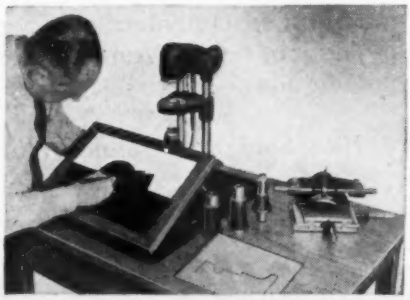
For highly magnified and illuminated inspection of bores as small as .110" diam., and as long as 72". Gives right angle or oblique vision of bore surface at any point.

SPENCER BINOCULAR MICROSCOPE

Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, .7 x to 8 x and of eyepieces, 9 x to 18 x. Essential wherever materials must be inspected for surface flaws, scratches, irregularities.

SURFACE FINISH STANDARDS

When used with Spencer Microscope, aids uniformity in surface finish by supplying comparison standards. All specimens clearly marked and graded.

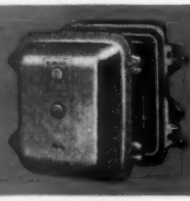
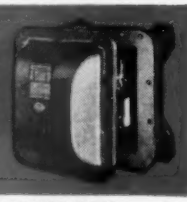
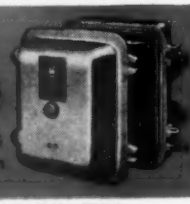


WILDER MICRO PROJECTOR

Throws magnified shadow image of work for comparison with master drawing. Most accurate way to check small parts, threads, gears, odd forms. Ideal for checking tool wear on screw machines by periodical inspection of work. Many other uses. Write for descriptive bulletins.

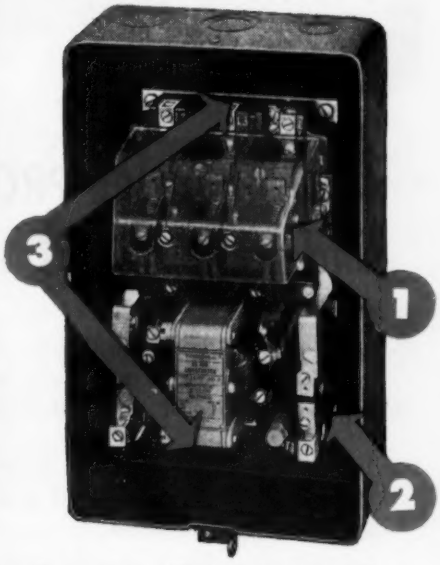
GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12 N. Y.

Pick this enclosure.....for this magnetic motor starting job

NEMA TYPE I **STANDARD SHEET STEEL ENCLOSURE** 	**GENERAL-PURPOSE INDOOR APPLICATIONS** —normal atmospheric conditions
CLASS 11-200-S LINESTARTER	
NEMA TYPE I-A **SEMI-DUST-TIGHT SHEET STEEL ENCLOSURE** (Felt gasket between cover and case) 	**GENERAL-PURPOSE INDOOR APPLICATIONS** —where some protection against dust is necessary
CLASS 11-200-V LINESTARTER	
NEMA TYPE V **GASKETED DUST-TIGHT SHEET STEEL ENCLOSURE** (Sponge rubber gasket) 	**DUSTY LOCATIONS** • Steel mills • Cement mills • Textile mills • Woodworking plants
CLASS 11-200-T LINESTARTER	
NEMA TYPES III and IV **WATERTIGHT and DUST-TIGHT CAST-IRON ENCLOSURE** 	**WET LOCATIONS** • Docks • Canal locks • Subways • Tunnels • Dairies • Breweries
CLASS 11-200-W LINESTARTER	
NEMA TYPE VII **CAST-IRON ENCLOSURE FOR HAZARDOUS LOCATIONS** Class I, Group D (Ground flanges on cover and case) 	**HAZARDOUS LOCATIONS** • Refineries • Distilleries • Varnish plants • Spray painting shops
CLASS 11-200-U LINESTARTER	
NEMA TYPE VIII **OIL-IMMERSED ENCLOSURE** 	**HAZARDOUS LOCATIONS** as above, also corrosive atmospheres • Tanneries • Pulp mills • Fertilizer plants • Chemical plants
CLASS 11-202 LINESTARTER	
NEMA TYPE IX **CAST-IRON ENCLOSURE FOR HAZARDOUS LOCATIONS** Class II, Groups E, F & G (Ground surfaces between cover and case) 	**HAZARDOUS LOCATIONS** • Flour mills • Grain elevators • Sugar, cocoa, coal pulverizing plants • Aluminum and magnesium processing plants
CLASS 11-200-Y LINESTARTER	

....get these Westinghouse Starter features!

1. **"De-ion" Arc Quenchers.** Arcs go out *quick*, making contacts last longer.
2. **Bi-Metal Overload Relay.** Accurate calibration for life of starter. Permits harmless overloads—protects motor against dangerous running overloads or stalled rotor conditions.
3. **Straight-Through Wiring.** All wiring front-of-panel. Ample wiring space.



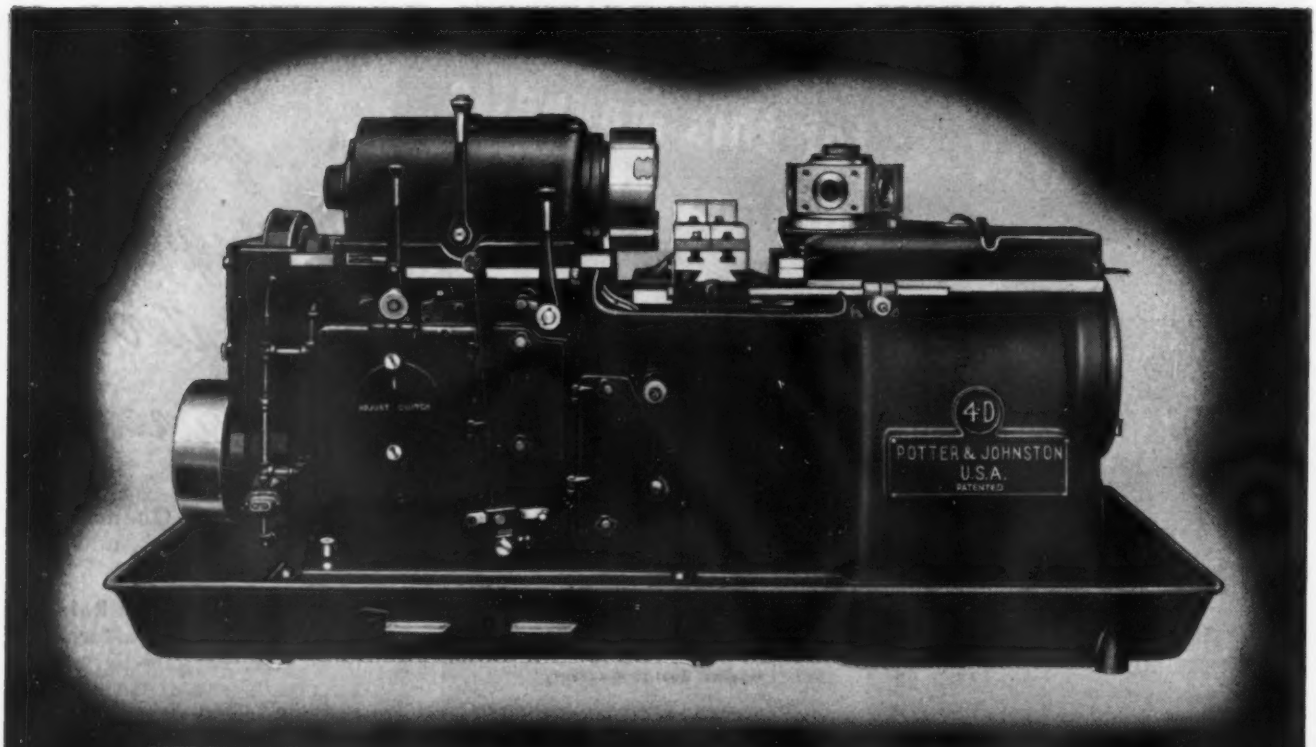
See your Westinghouse Distributor or write for D. B. 11-200. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-60615

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

MOTOR CONTROL



The P&J 4-D MANUFACTURING AUTOMATIC CHUCKING and TURNING MACHINE

PERFORMANCE PROVED *for* ACCURACY *and* LOW COST PRODUCTION.....

Many production problems involving the duplication of small parts have been solved by the Model 4D P&J machine. Time and again it has demonstrated its superiority over hand machines as a means of improving quality of work and of reducing costs.

This machine is of compact design and rugged construction. Features include: a high carbon forged steel spindle mounted on Timken Tapered Roller Bearings; headstock gearing of Chrome Nickel Steel, heat treated; all shafts of heat treated alloy steel mounted in ball bearings; 15 speed changes between 24 and 335 R.P.M. arranged in five sets of three automatic changes; 27 feeds in geometric progression.

CONDENSED SPECIFICATIONS

Swing over bed—21" dia.
Swing over cross slide—9¾" dia.
Cross slide travel—each way—3¼"
Number of turret faces—5 std. 4 and 6 spec.
Hole in turret—2" dia.
Turret feed—5½"

Send for Bulletin 112 giving complete details

IT'S TIME TO BUY *EXTRA* VICTORY BONDS

POTTER & JOHNSTON MACHINE CO.
Pawtucket, Rhode Island

NEW... DIFFERENT...

astonishing productivity
plus ultra-convenience

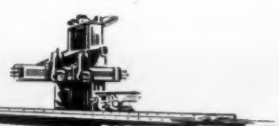
Watch for the Announcement

The **GRAY PLANER CUB**
.. it's a 'bear' for production

The **GRAY HANDY MILL**
.. the last word in convenience

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS

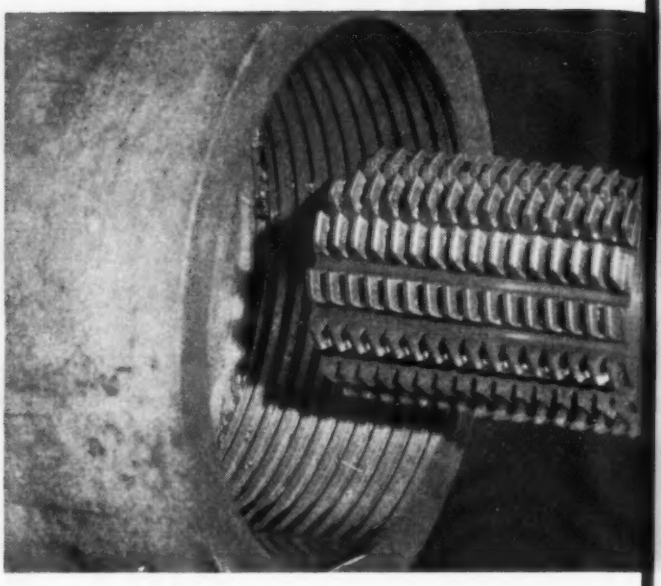
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



The G.A. **GRAY** *Co.*

CINCINNATI 7, OHIO, U. S. A.

Rotary MILLING



THIS CROSS MACHINE sharply reduces the cost of machining cylindrical, conical or flanged work-pieces. Equipped with special work-holding fixture and a multi-tooth form cutter, it mills this spherical contour with unerring accuracy in one-twelfth of the time previously required. Its full automatic cycle and push-button control permit unskilled operators to achieve top accuracy and production. In addition to rotary milling, the machine may also be used for a wide variety of internal or external thread-milling operations.

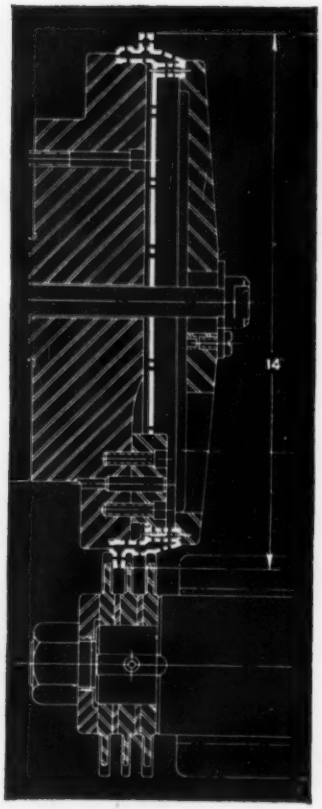
If you have a production problem in milling, boring, turning, drilling, tapping, reaming, grinding or honing, solve it with a Cross Machine, specially designed and built to suit your needs. THE CROSS COMPANY, Detroit 7, Michigan, Dept. 181.

S-26

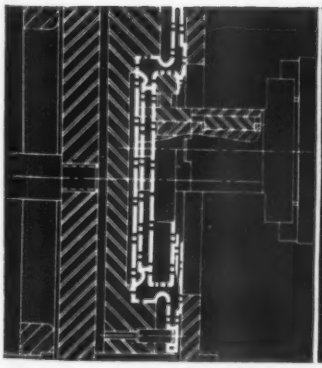
CROSS

New York • Chicago • DETROIT • Cleveland • Cincinnati

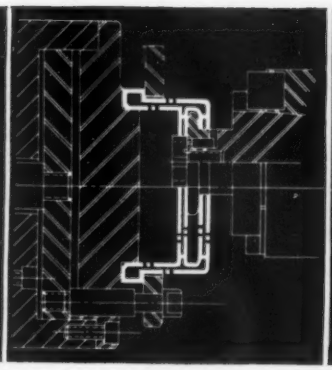
AND THREADING



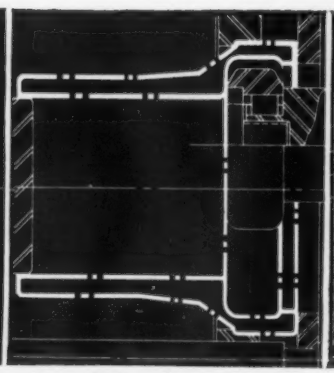
External operations with interrupted cuts are finished to close tolerances with the Cross Rotary Miller.



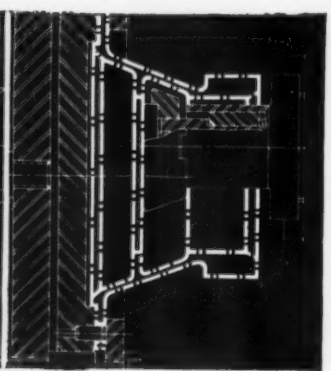
Rotary milling is an ideal method for handling many difficult operations on aircraft parts.



Multiple edge cutting tools with an enveloping cutting action satisfy the most exacting demands for fine finish.



Deep internal contours can be finished in one operation with the Cross Machine.



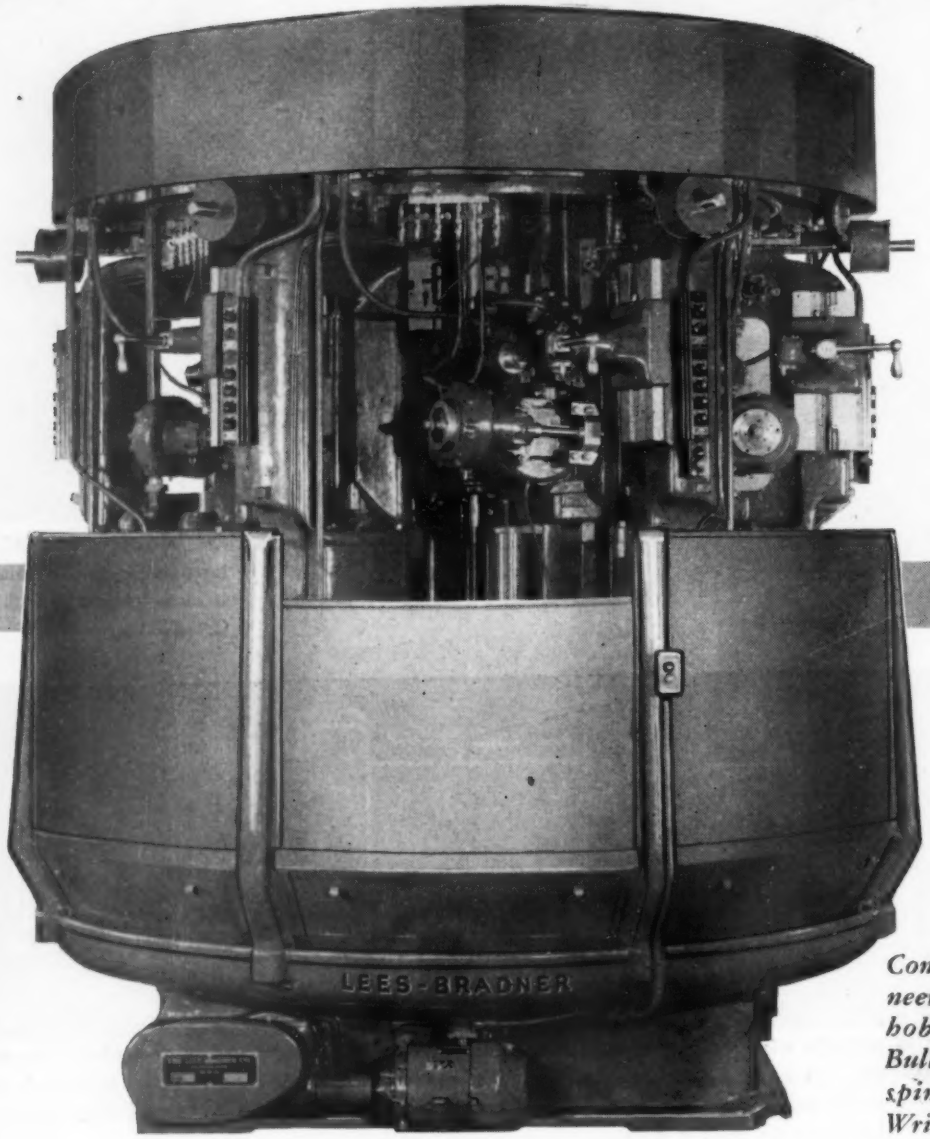
Irregular contours are processed in the usual way without special attachments or tooling.

SPECIAL MACHINES

for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

THE LEES-B

Automatic Rotary Gear Hobbing Machine

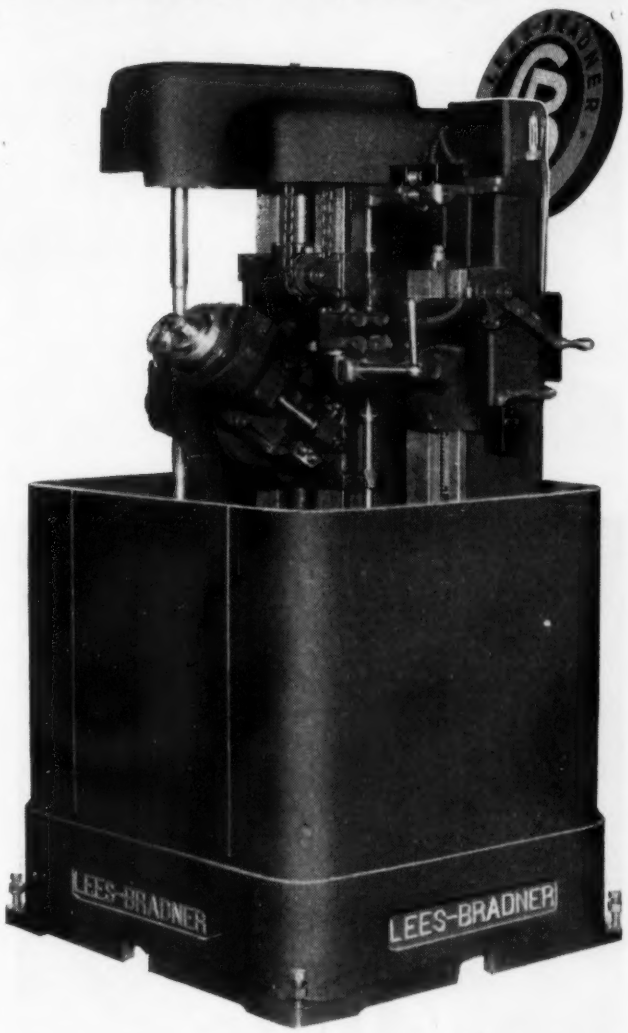


Consult a Lees-Bradner engineer on your precision gear hobbing and spline work. Bulletins on this and single spindle models available. Write for yours.

● Here's a high speed hobber that is particularly designed for the mass production of accurate gears—splines and similar work. It is built in four—six—or eight spindles and may be arranged for the production of the same job or several different jobs—climb or conventional cut. Lees-Bradner pioneered this construction and it has proved most successful in the production of precision gears and spline work in large quantities.

S-BRADNER

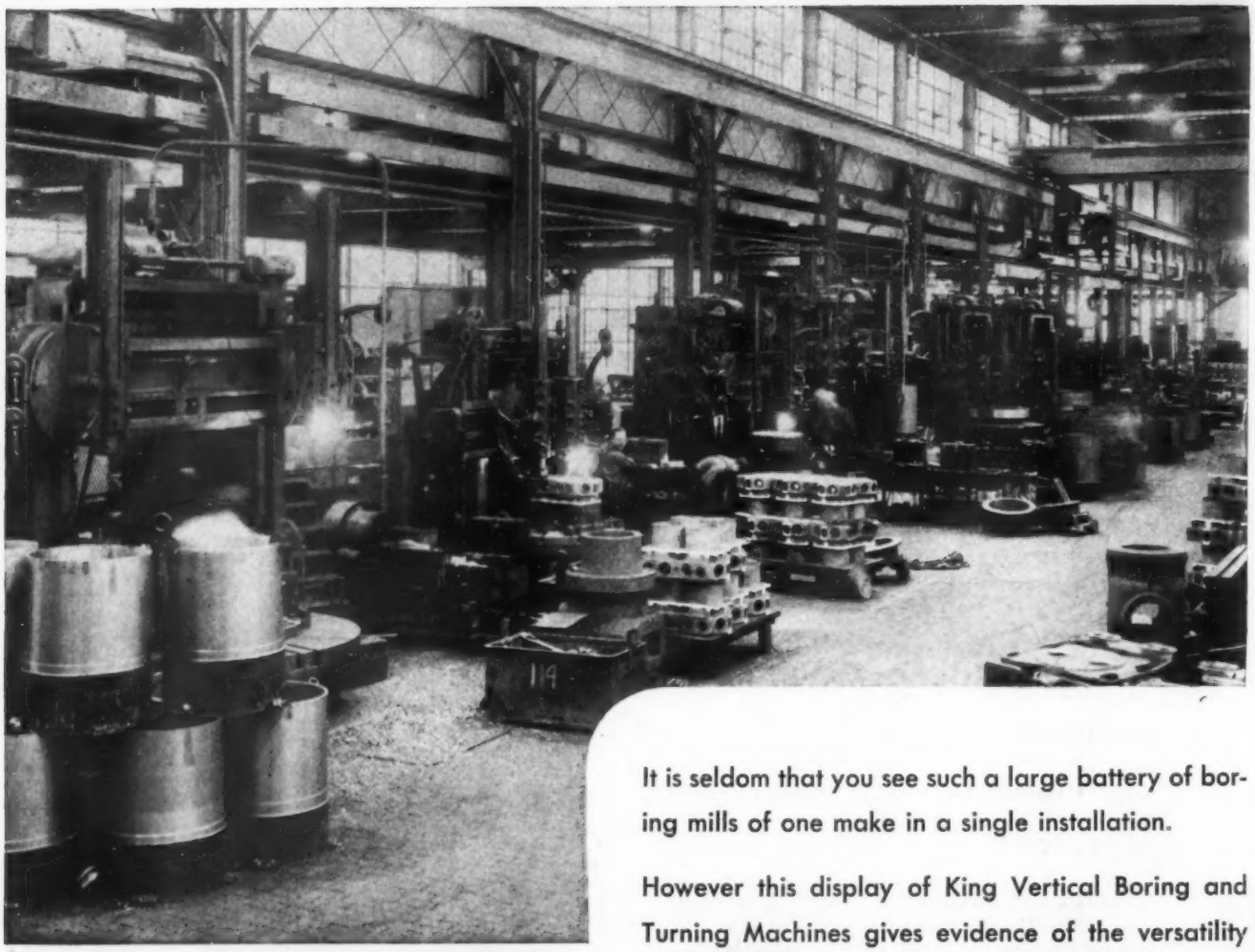
7-A Single Spindle *Automatic* Production Hobbing Machine



● This hobbing machine was designed and built for automatic continuous heavy production. It represents over thirty years of effort in the development of finer more accurate gear hobbing equipment. Suitable for spur gears, helical gears, sprockets, plunge cut or straight spline shaft serrations and cam shaft gears. It is adaptable to either conventional or climb cutting and available with an automatic hob in-out mechanism.

The **LEES-BRADNER** *Company*

CLEVELAND 11, OHIO, U.S.A.



It is seldom that you see such a large battery of boring mills of one make in a single installation.

However this display of King Vertical Boring and Turning Machines gives evidence of the versatility —productivity—and satisfaction they give you on the various types of work to which they are adapted.

King Boring and Turning Machines have the stamina to produce 24 hours a day—speed and feed range to meet varying operating conditions—rigidity to maintain precision tolerances over long periods.

For speed—accuracy—high production—and all around adaptability put your precision boring—turning—facing and similar work on a KING.

KING BUILDS *Vertical Boring and Turning Machines exclusively—single column types from 30" to 42"—double column types from 52" to 12 feet.*

– TURNING
– BORING
– FACING

Are a few of the operations being performed on this battery of . . .

KING

VERTICAL BORING & TURNING MACHINES

THE KING MACHINE TOOL COMPANY

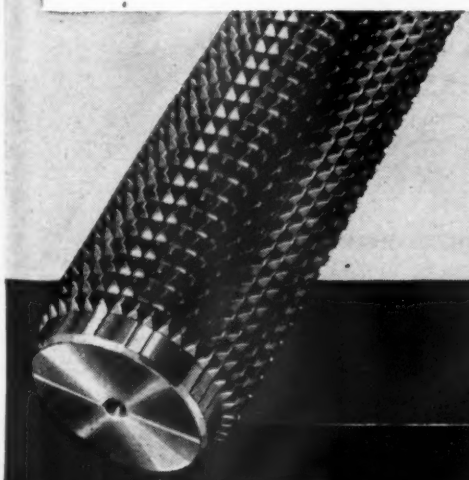
CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

In Broaching A Good Tool Comes First!

Insist on CONTINENTAL BROACHES

If you want to get all-round top performance in your broaching operations . . . *the best in low unit costs, in production, in accuracy and finish* . . . make sure the broach you use is designed and manufactured by Continental Tool Works, for 26 years a main source for fine cutting tools. The wide experience in the broach-making field that Continental engineers have had is at your disposal. If you have a broaching problem, consult them today.



Continental makes a complete range of internal and external (surface) broaches, also broach fixtures, holders and pullers, all to high Continental precision standards.

CONTINENTAL TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS — CTW — EX-CELL-O CORPORATION

CUTTING TOOLS

- Boring Bars and Tools
- Broaches
  Broach Pullers
  Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

LEADERSHIP
PROVED BY HUNDREDS OF CASE HISTORIES...

Many case histories, such as the one featured here, demonstrate the versatility of New Britains at work... forecast their productive value in the years ahead.

A typical example is the Main Drive Gear Bearing Retainer pictured here. The number of cuts required, the need for economy of operation and speed of production with rejects held to a minimum posed a problem which was solved by the selection of New Britain Model 675 Six Spindle Automatic Chucking Machines.

The first problem was to place tools so that this cast iron piece could be loaded, and the bore and flange completely machined in the first four stations. The number five station carried a multiple drill head that machined the three holes in the flange at one time. The sixth station carried a collapsing tap for putting in oil grooves. This right hand spiral groove was 3/32" wide and 1/16" deep, and had to be held concentric with the bored and turned diameters within .002 total indicator reading. Sixteen operations in all, performed in 15 seconds, with gross production of 240 pieces per hour.

This is another case where the versatility and advanced engineering of New Britains solved a difficult problem. In peacetime production they will solve many more . . . yours too.

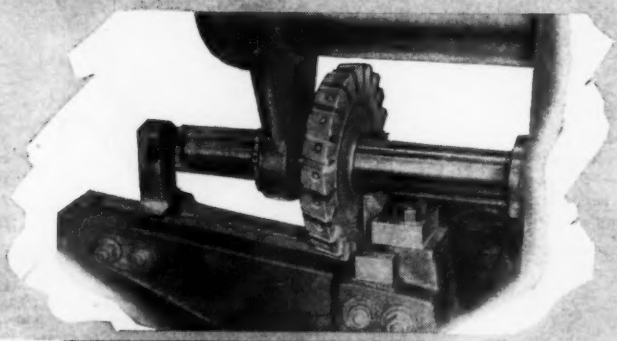
NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN • GRIDLEY DIVISION

KEARNEY & TRECKER

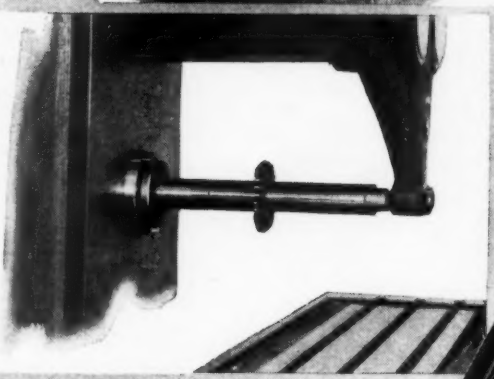
Milwaukee ARBORS

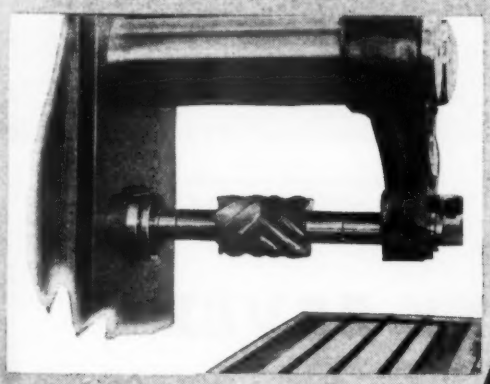
STANDARDIZED AND INTERCHANGEABLE . . . FOR ALL STANDARD MILLING MACHINES



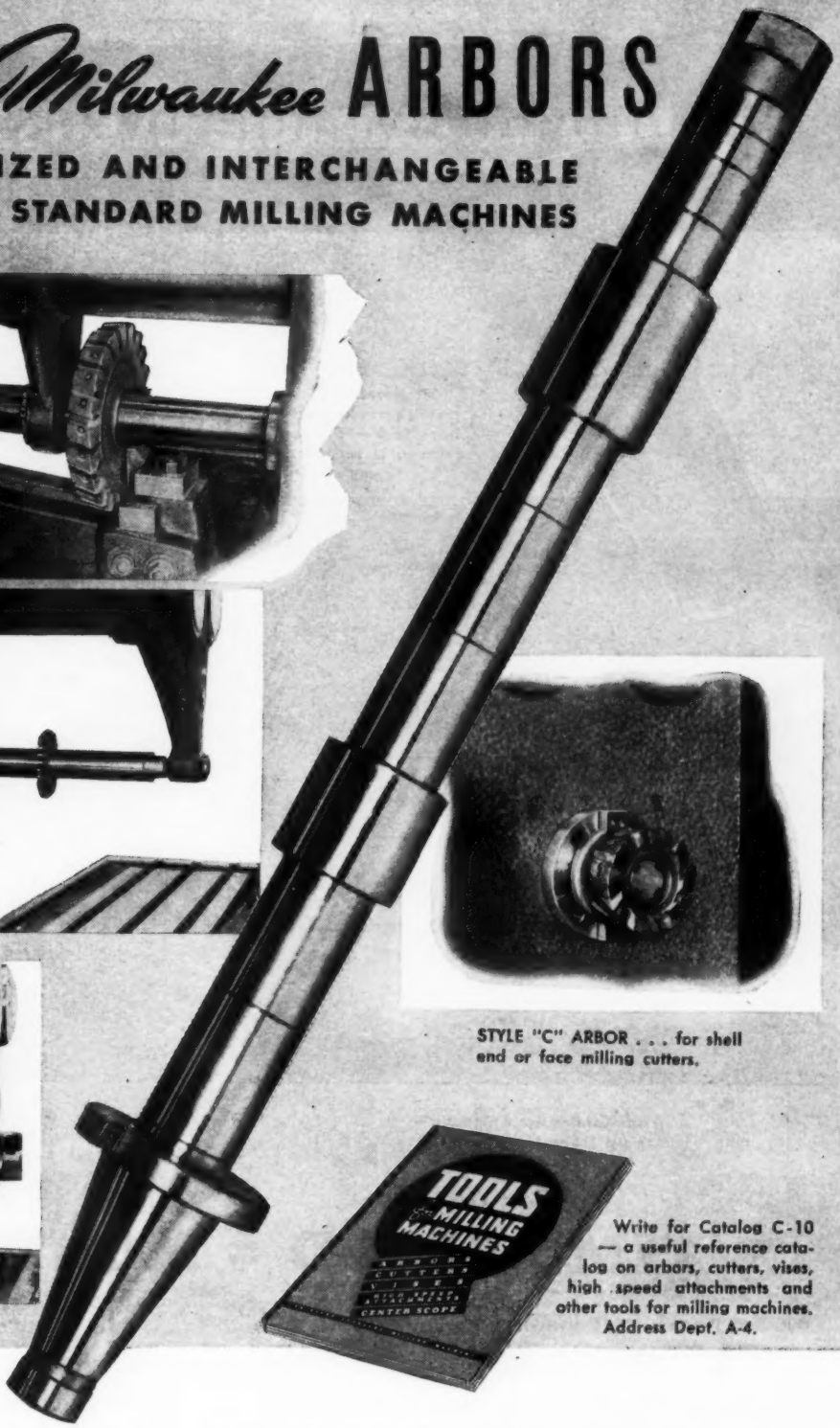
STYLE "A" ARBOR . . . normally used on light cuts. Pilot end provides maximum clearance between arbor and workpiece or holding-fixture.

STYLE "B" ARBOR . . . for heavy cuts. Wide selection of lengths and diameters for any required operation.





STYLE "C" ARBOR . . . for shell end or face milling cutters.



Write for Catalog C-10 — a useful reference catalog on arbors, cutters, vises, high speed attachments and other tools for milling machines. Address Dept. A-4.

A good arbor is essential to get the best in performance from your milling machines.

Milwaukee arbors are precision tools—their use provides milling accuracy, long arbor and cutter life, profitable performance.

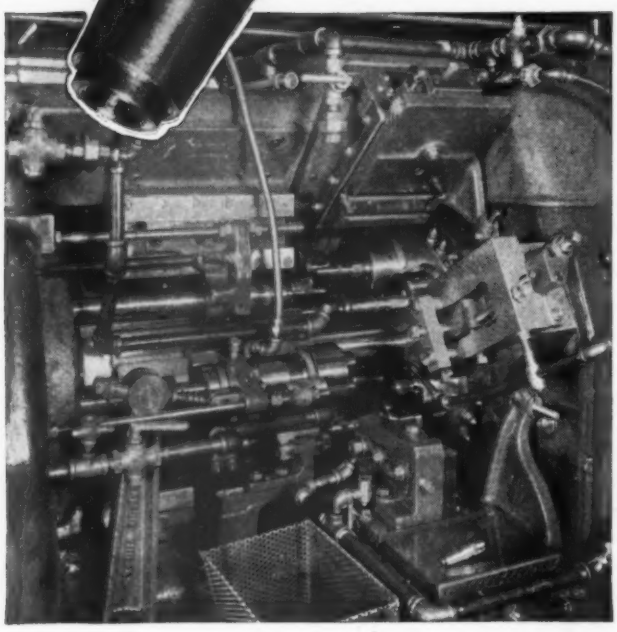
You can use Milwaukee arbors on any standard milling machine in your plant, equipped with a National Standard Spindle End. For complete information on arbors and milling tools, write for Catalog C-10.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC JIG BORER • CENTERSCOPE.

Kearney & Trecker
Products
CORPORATION
MILWAUKEE 14, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

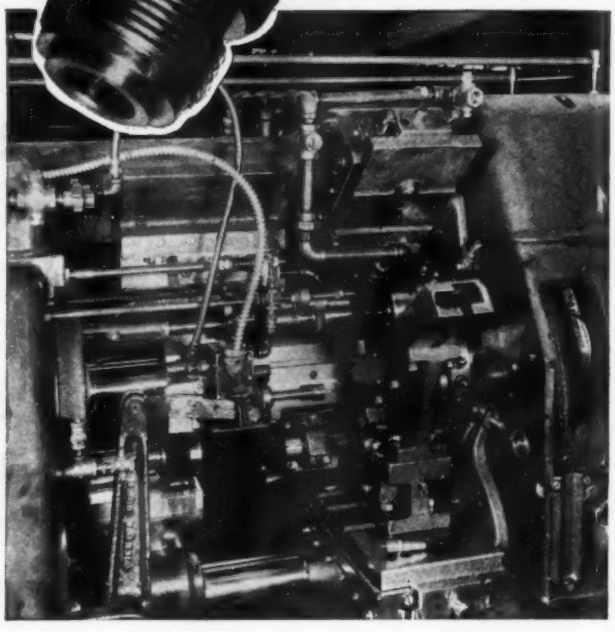
Up-to-date example of COST REDUCTION

1st operation on automotive part—turned from bar stock—15 operations in 16 seconds.



Acme-Gridley Bar Automatic—set up from 1st operation.

2nd operation on same—or duplicate—machine. 6 operations in 11 seconds—with magazine feed.



Set up for second operation showing magazine in position.

TIME SAVED = MONEY SAVED

AUTOMATIC loading methods on Acme-Gridley Machines—gravity or conveyor magazines, feeding through rear of spindle and pick-off—introduce new ways to reduce the cost of precision parts, wherever secondary machining is involved.

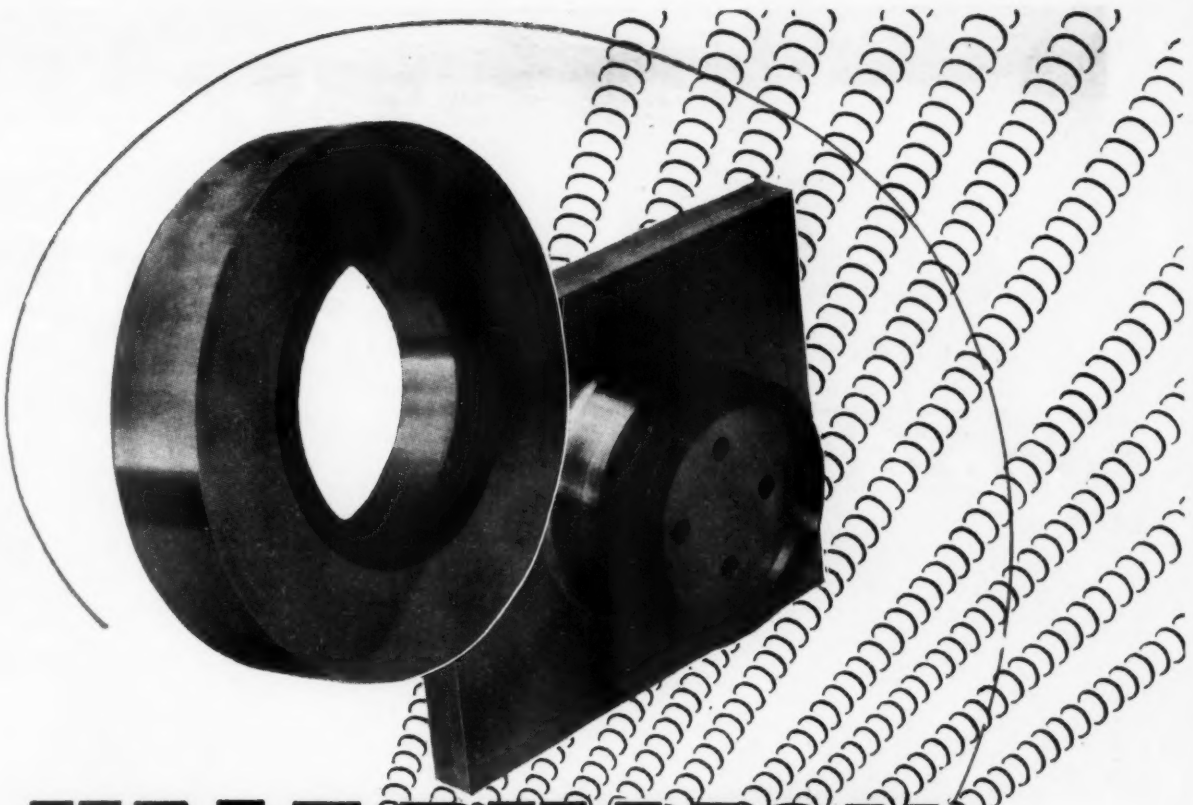
The Acme-Gridley is truly a universal machine, with quick adaptability to a wide range of work, under conditions of high production and extreme accuracy.

Tell us your production problems—and we will tell you how fast. No obligation.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

COLLETS AND PUSHERS
The design, materials and methods of processing GENUINE Acme-Gridley Collets and Pushers are vital to continuous low-cost performance on your Multiple Spindle Automatics.
Bulletin CP-45



over a HALF BILLION "cookies" .... and STILL GOING

with these Diecarb dies

SEVERAL years ago, in a Pittsburgh electrical manufacturing plant, a disc or "cookie" die was placed in operation. It was made of Diecarb, Firth-Sterling's newest, original, sintered carbide development for blanking dies. This "cookie" die blanked a circle of silicon electrical sheet .025 inch thick, to be used in rotors and stators.

It proved so successful that since then two other similar Diecarb dies have been put to work—all averaging *50 to 60 million* blanks per grind, as compared with 90,000 pieces per grind with high speed steel dies.

The original die, at the latest count, had produced the unprecedented total of over a half billion stampings, and was still going!

In fact, the life of these remarkable Diecarb dies is not yet determined because all dies so far made are still in use.

Diecarb can be used for blanking and forming a diversity of materials including metals, plastics, paper, etc. It operates successfully on thicknesses up to 7/16 inch. It is proving unmatchable for high production operations, saving both downtime and maintenance.

If you have a product that requires blanking or if you are planning one—call in Firth-Sterling now to test the possibilities of Diecarb.

GET IN TOUCH WITH US

A complete Diecarb engineering service is at your call—for designing complete dies; for aiding in application of Diecarb to die shoes by brazing; shrink-fitting; press fitting and mechanical matrix; and for proper grinding.

Firth-Sterling

STEEL COMPANY

OFFICES: McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA
PITTSBURGH • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

WITH *MOTCH & MERRYWEATHER*

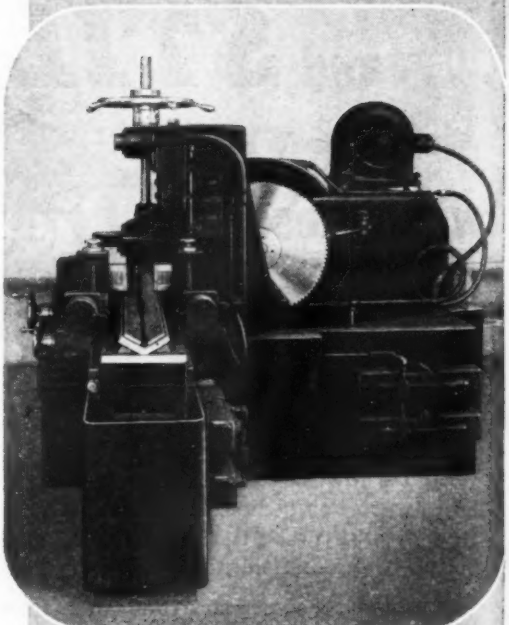
Automatic

COLD SAWING MACHINES

More for less,— that is today's demand in every field — for production with accuracy. It is, likewise, for *known* costs — for costs *known to be irreducible*. Let us tell you what Motch & Merryweather Automatic Cold Sawing Machines will do to help your earnings in the tightening competition immediately ahead. They cut your investment in finishing equipment, reduce second operation work. They eliminate scrap, improve processing, lower metal-sawing costs.

Write for our new Bulletin "A-11"

THE MOTCH & MERRYWEATHER MACHINERY COMPANY
Penton Building · CLEVELAND 13, OHIO



The Motch & Merryweather Automatic Cold Saw attains efficiencies much higher than manual methods since it removes the element of human fatigue.

Built by **MOTCH & MERRYWEATHER**

MOTCH AND THE MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT
CINCINNATI PITTSBURGH

SUN SPIRITS...

Degreases and Cleans Small Parts; Replaces Expensive 5-Step Process

An eastern manufacturer cut the cost of degreasing and cleaning small parts in half when he started using Sun Spirits.

Costly equipment, including lead tanks, rubber shoes and gloves, etc., was formerly used in a complicated finishing process.

A Sun Engineer recommended a simple, fast cleansing in Sun Spirits, and, as a result, all the former chemicals were eliminated.

Five operations were replaced with one, and total estimated savings in labor, materials, time, and equipment were equal to one-half of the previous costs.

The fast, spotless cleaning now being obtained in this plant is typical of the performance of Sun Spirits in cleaning parts and machines in hundreds of plants. To remove oily, greasy films cleanly, quickly, and safely, call the Sun Engineer near you, or write . . .

SUN OIL COMPANY • ***Philadelphia 3, Pa.***
Sponsors of the Sunoco News-Voice of the Air—Lowell Thomas

SUNOCO **SUN INDUSTRIAL PRODUCTS**
OILS FOR AMERICAN INDUSTRY

J&L STEEL

COLD DRAWN BARS

Precision, smooth finish, uniformity are the prime qualities you insist on in cold drawn steel bars. Our metallurgical engineers will be glad to discuss your production problems with you.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PENNSYLVANIA

WHY MONSIEUR DESCHAMPS NEVER OWNED A CAR

IT isn't that he never wanted one. A Frenchman of the upper middle class appreciates the good things of life. But the bitter truth is that French industry never produced a car that Monsieur Deschamps (or 85% of French families) could afford. Yet, the motor car was invented in his country.

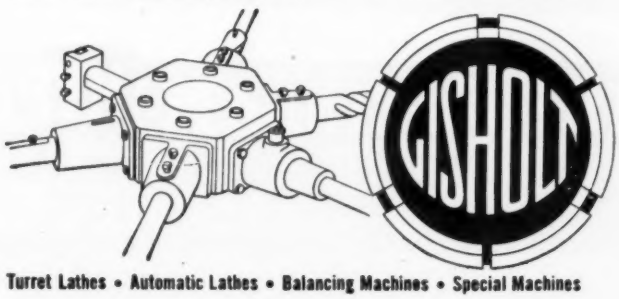
Yes, the first automobile rolled in Paris. But the first assembly lines rolled in Detroit! And they reached a peacetime tempo where "a car for every family" came nearer fact than fancy—where America's automotive industry was producing more cars in six months than existed in all of France.

Swift-moving assembly lines are only the symbol of mass production. Look behind them and see how they're fed. You'll find, for example, *mass machining*—the producing of as many as 3,600 machined parts in a single automobile. Multiply that by nearly 5,000,000 cars a year and you see the need for speed and accuracy to get costs down where the average family can own one.

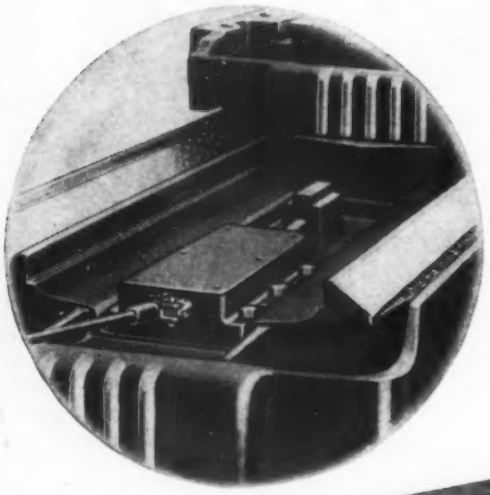
In those long rows of machine tools you'll find many with the name "Gisholt." And you'll find Gisholt engineers, too, working hand in glove with manufacturers in the never-ending search for ways to do the job still better, at still lower cost. It's a constant challenge to do our part for an industry that creates employment for nearly 7 million people and contributes so much to the enjoyment of life in America.

GISHOLT MACHINE COMPANY

1201 East Washington Ave. • Madison 3, Wis.



Turret Lathes • Automatic Lathes • Balancing Machines • Special Machines



Designed for greater safety at higher speeds

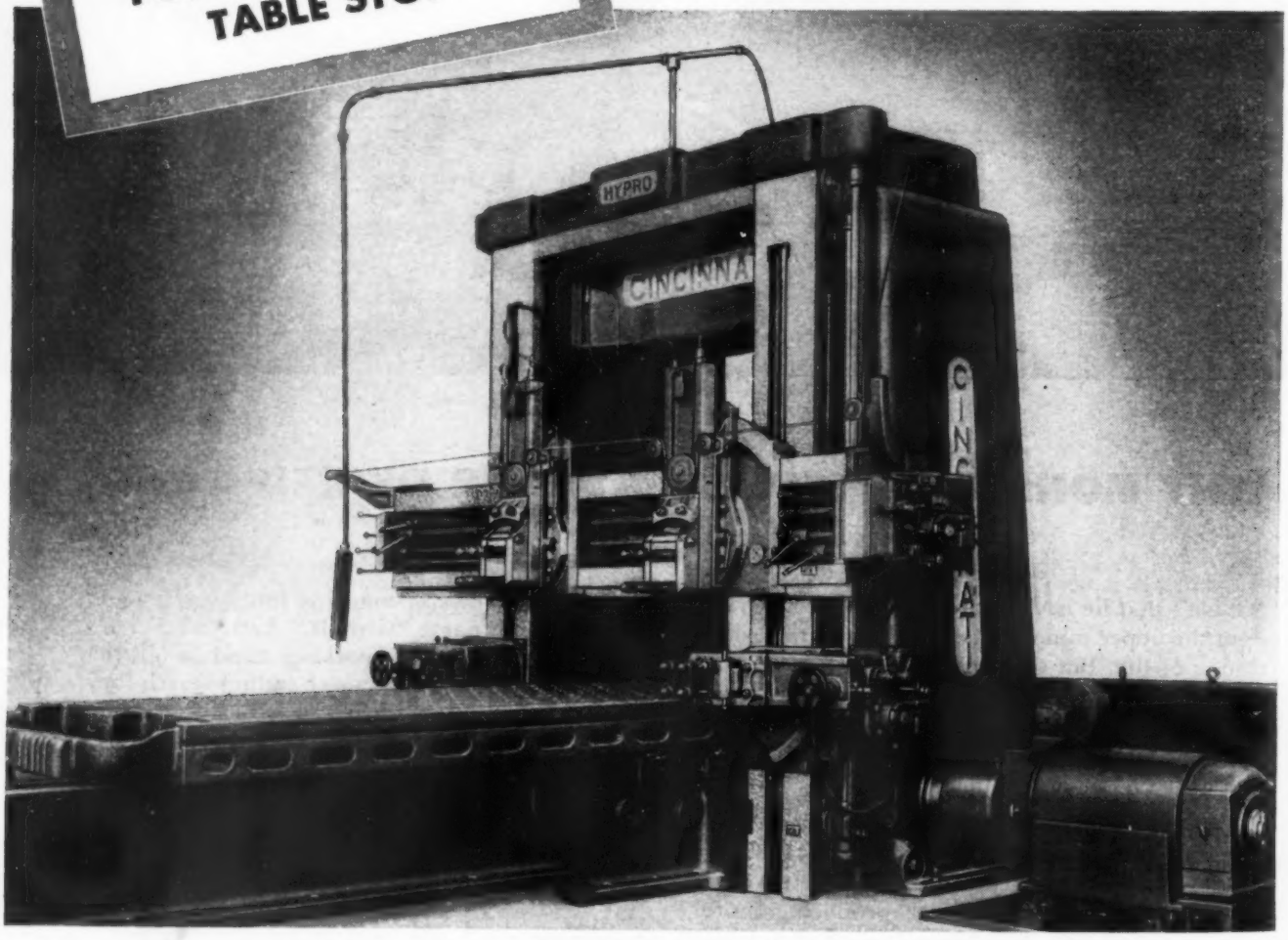
It is now possible to obtain a positive hydraulic safety stop and jack to completely protect anything around the machine in case of complete failure of the electrical control.

This safety stop is designed to stop the table quickly in case of control failure with a uniform decelerated motion without severe shock to parts of the Planer. All parts are completely enclosed to protect them from dirt and chips so there is no chance of failure.

This stop also is used as a jack for relocating the table over the bull wheel by inserting a handle in the stop and pumping the table back to its running position. No crane or other means, therefore, is required for this operation which invariably results in damage to the gear teeth.

After the stop is used it automatically resets itself. The operator or maintenance department does not have to replace any parts or reset any mechanism, thereby saving time and eliminating the human element.

HYPRO PLANER
Positive Hydraulic TABLE STOP



THE CINCINNATI HYPRO PLANER COMPANY
PLANERS · BORING MILLS · PLANER TYPE MILLERS
CINCINNATI, OHIO

If you have a WEAR-RESISTANT Problem

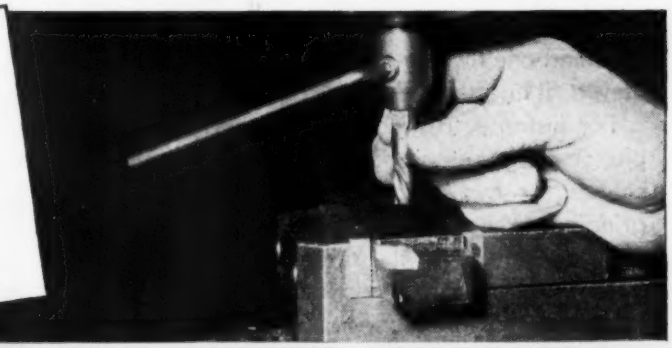
THIS milling machine collet, in its original form, had an average life of two to three months, before being scrapped. Instead of scrapping it—we bored it out, inserted two simple Kennametal bushings—and now, after 11 months of continuous service—it shows no apparent wear!

Yes, inexpensive Kennametal inserts can be successfully substituted after the original material has failed, and can give greatly extended life to otherwise worn-out parts. *But the logical place to insert Kennametal is in your original design.*

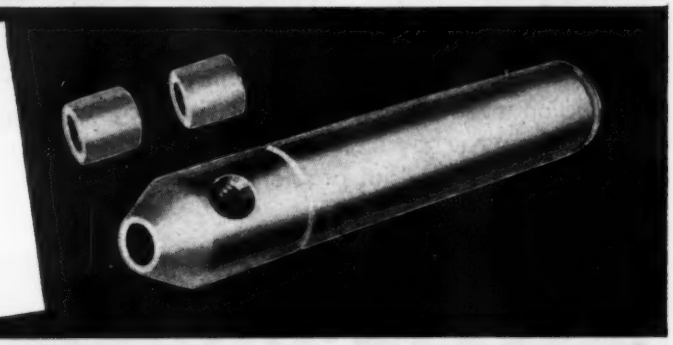
How much will it cost you to use Kennametal? There is a strong possibility that your product may actually cost less to produce with Kennametal, than it now does without it. Why? Because the incorporation of Kennametal at friction and bearing points in your basic design often makes possible a more compact, simplified, lighter-weight component that requires less of other materials, and a minimum amount of Kennametal. And, this does not take into consideration ... the greater sales possibilities, and customer satisfaction, inherent in a product whose service performance is immeasurably improved by the wear-defying characteristics of Kennametal.

Our metallurgists, engineers, and the facilities of a highly-specialized experimental laboratory are available to help you. And remember, Kennametal can be used in your basic design without entering into any complicated, continuing agreements.

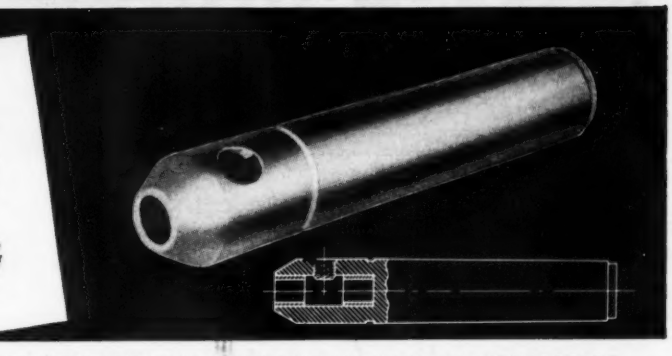
Consider the case of this COLLET



Its service life in original form WAS 2 TO 3 MONTHS



NOW with KENNAMETAL INSERTS... It has been used 11 months and shows NO wear



KENNAMETAL WEAR-RESISTANT CHARACTERISTICS

- Up to 80.6 Rockwell C hardness as compared to 66 for hardened tool steel—abrasion resistance up to 100 times that of steel.
- Non-galling—low frictional resistance between it and steel, and other materials, minimizes galling of parts from rubbing contact.
- Dimensionally stable; low rate of thermal expansion—"creep" is negligible.
- High resistance to deformation—modulus of elasticity is 2 to 3 times that of steel.
- Compressive strength—resistance to crushing is 10% to 15% greater than that of hardened tool steel.

There are several compositions of Kennametal, having different combinations of properties suitable for specific applications. Our metallurgists will recommend the proper grade after analyzing your need.

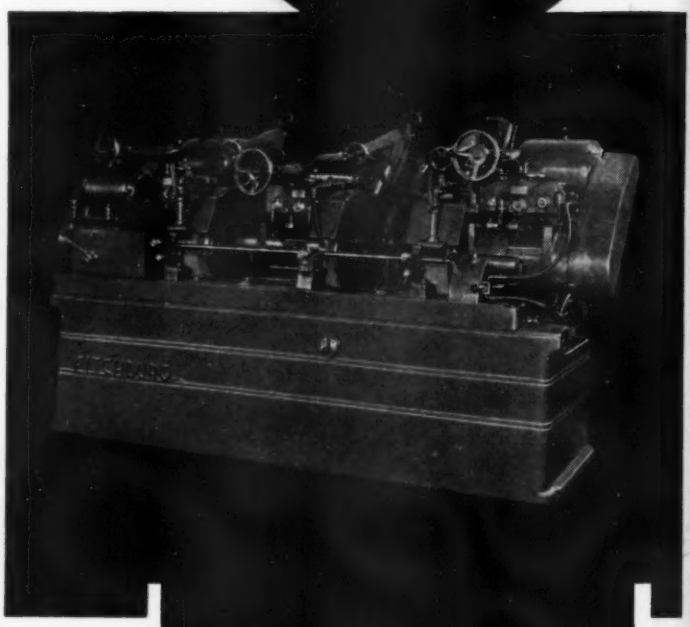
KENNAMETAL

SUPERIOR CEMENTED CARBIDES

TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL Inc., LATROBE, PA.

THIS HEAD
PUTS ITS *"Nose to the Grindstone"* FOR MULTIPLE PRECISION GRINDING



To bring precision grinding the advantages which multiple tooling and combined cuts have given machined work in mass production, Fitchburg engineers put their heads together.

The result, the Fitchburg independent standard Bowgage Head, completely self-contained, and enabling one machine to perform as many operations as it has heads with which to grind.

For instance, a machine can be arranged for plunge-cut grinding one end and the second head set up for hydraulic traversing for longitudinal grinding, while the number three head is also plunge-cut grinding the other end. This is advantageous on gun barrels or long spindle type pieces where three operations are necessary — and all three operations will be performed within the time of the longest single operation!

If you have an "axe to grind" with your current production speeds and costs, let Fitchburg engineers show you how the Fitchburg method can be applied to your special problem. No obligation. Write today !

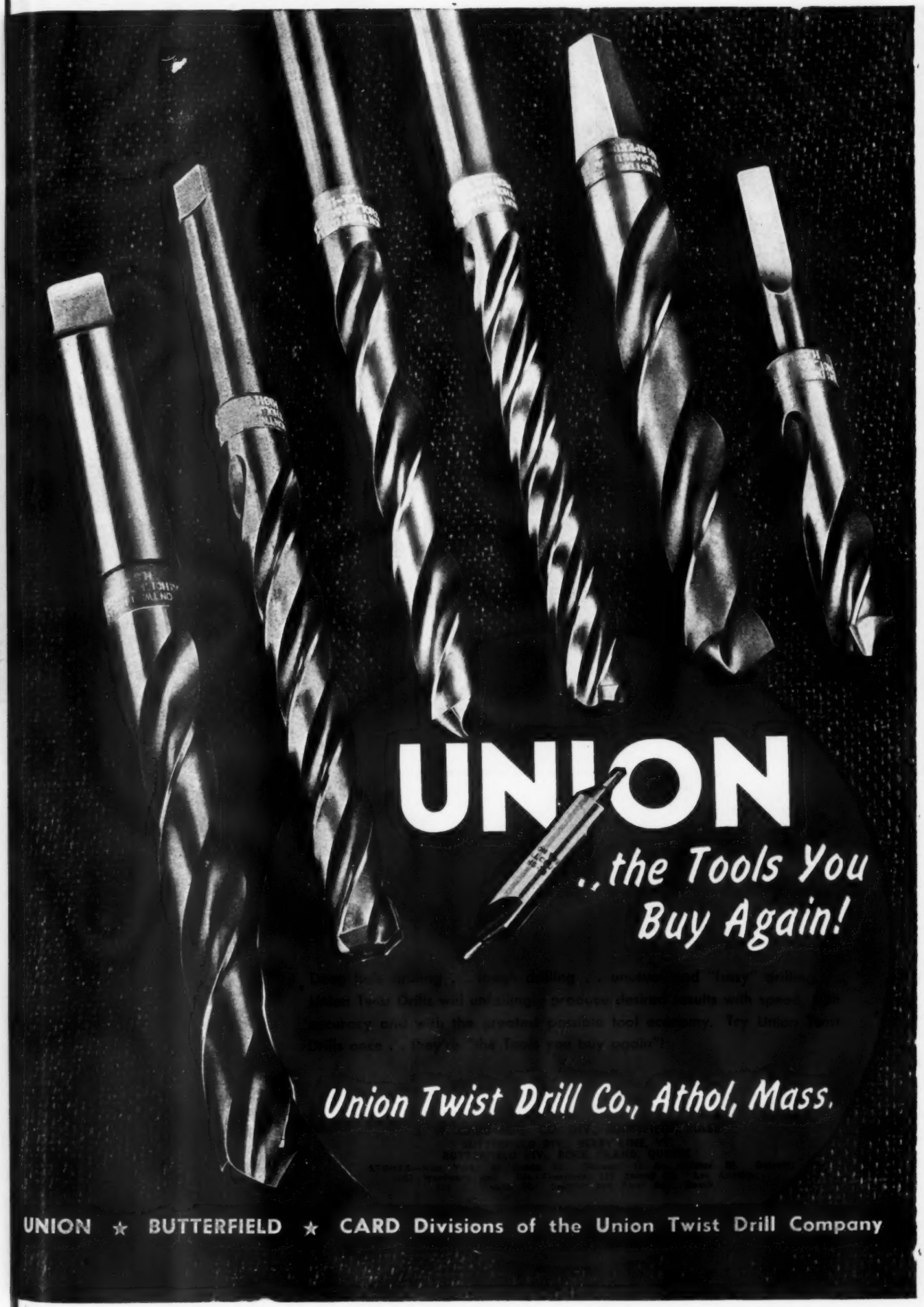
FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

THE HEAD. *The Bowgage Head* is a completely independent precision grinding unit. It has rapid traverse, slow grinding feed, grinding dwell or spark out, and rapid return to starting position — all started by one push button. It is precise to .0002", minimizing spoilage. It can be removed and remounted for other work, if operations are changed.

THE BODY. *The Fitchburg Triple-Head Machine* illustrated is typical of the functional engineering and rugged construction of many special machines into which independent Fitchburg Bowgage Heads can be built to cut costs through multiple automatic precision grinding on mass production. It grinds three dimensions at the same time, within time of longest single grinding operation, and in one handling — with consequent saving in time and reduced danger of spoilage. By grinding several dimensions automatically on the same piece, at one mounting, it releases operator for other work.

Write Today for Catalog—Sent Free Upon Request


UNION
..the Tools You Buy Again!
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company

CARD TAPS

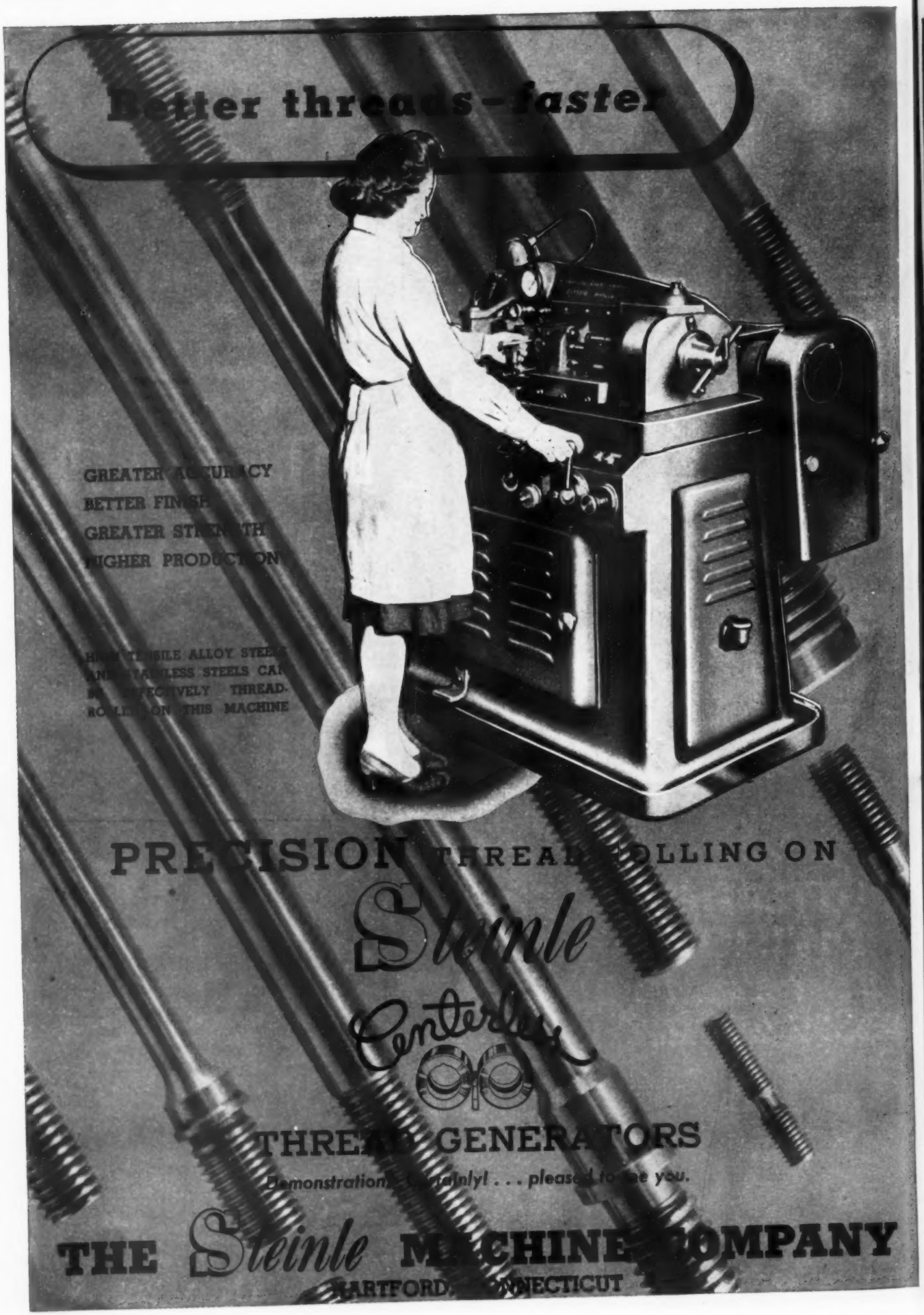
Reputation for exceptionally high quality and unquestioned accuracy make Card Taps the "standard" in many shops which are now getting set for a schedule of uninterrupted peacetime production.

S. W. CARD MFG. CO.

Mansfield, Mass.

UNION • BUTTERFIELD • CARD Divisions of

TOOL ECONOMY
is prerequisite for peacetime production. Tool Economy is one of the features of Butterfield Tools. You get QUALITY when you specify . . .
BUTTERFIELD
REAMERS by BUTTERFIELD
TAPS by BUTTERFIELD
BUTTERFIELD DIVISION
Derby Line, Vt.
Rock Island, Que.
of the UNION TWIST DRILL COMPANY


Better threads—faster
GREATER ACCURACY
BETTER FINISH
GREATER STRENGTH
HIGHER PRODUCTION
PRECISION THREAD ROLLING ON
Steinle
Centerless
THREAD GENERATORS
Demonstrations gladly! . . . pleased to see you.
THE Steinle MACHINE COMPANY
HARTFORD, CONNECTICUT

For
ALL MAKES OF
AUTOMATICS,
CHUCKING MACHINES
AND
TURRET LATHES

HARDINGE

ENGINEERED COLLETS AND FEED FINGERS

The combination of performance and price means maximum efficiency . . . that is what you get when you specify HARDINGE Collets and Feed Fingers.

HARDINGE BROTHERS, INC.
Elmira, N. Y.

MIDDLE-OF-LIMITS ACCURACY . .

year after year with

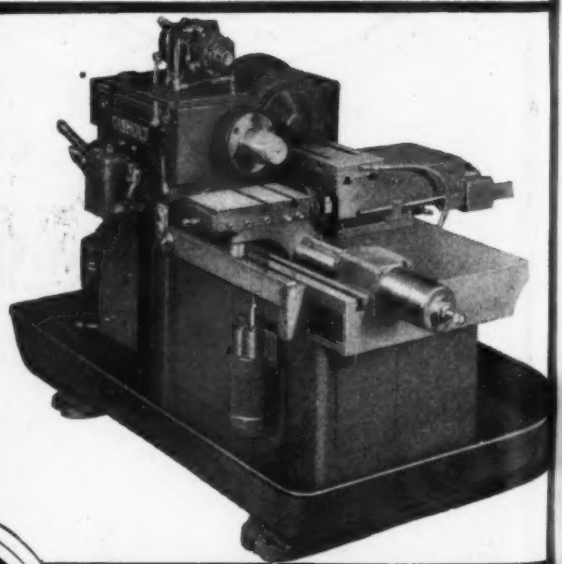
THE GISHOLT HYDRAULIC AUTOMATIC LATHE

You won't have the usual loss of accuracy caused by wearing parts—even after years of service—with this modern automatic lathe—for here are no complicated mechanisms to wear. Its simplicity reduces moving or mechanical parts to a very minimum.

All parts having to do with tool movement are completely surrounded by oil and lubricated under pressure. Both carriages move on hardened and ground steel surfaces. For all practical purposes, there is no wear out. Further, since both front and rear tool slides feed against and dwell at positive dead stops, utmost accuracy in finished dimensions is insured.

With this advanced automatic lathe, you can count upon middle-of-limits performance for years on end. Moreover, you can count upon trouble-free operation that cuts maintenance bills to the vanishing point! Write for complete information.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wis.



GISHOLT

THE GISHOLT HYDRAULIC AUTOMAT LATHE provides a 12" swing over front carri Although it is a heavy, rugged machine, it is well suited for light, fast jobs.

Look Ahead... Keep Ahead... with Gish Improvements in Metal Turning

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHIN

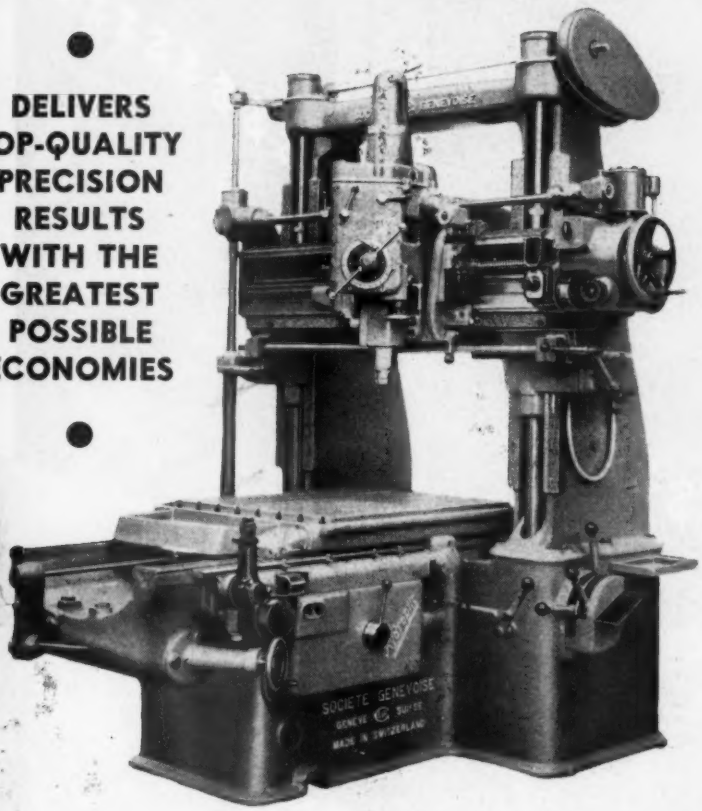
FAMED SIP PRECISION

now available to American Industry on the

HYDROPTIC-B JIG BORER

BORING DRILLING and MILLING

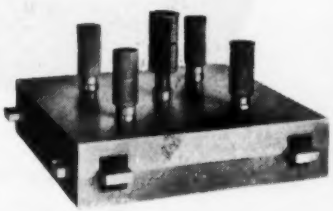
DELIVERS TOP-QUALITY PRECISION RESULTS WITH THE GREATEST POSSIBLE ECONOMIES



The salient features of the famous "SIP" Jig Borers are emphasized in the improved HYDROPTIC-B . . . guaranteed accuracy to 0.0002" for all settings of work table and spindle head . . . table working surface 39.5" x 32". This high precision equipment is ideally suited for production as well as the tool room. Incredible precision is obtained through the use of an exclusive Optical Measuring System, consisting of protected scales and microscopes of unquestioned accuracy. The exclusive design developed by "SIP" eliminates the need for lead screws. Work table on this Jig Borer and Milling Machine is hydraulically controlled, and permits rapid table traverse over its full stroke as fast as 30 seconds. Excellent deliveries. Complete detailed information and Catalogs upon request.

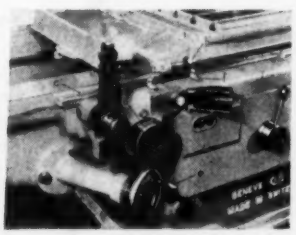
Proof of Accuracy!

These two cast iron plates were machined independently on the HYDROPTIC-B, five holes 0.7874" dia. and four slots 0.9842" wide in each plate. Standard plugs and gages snugly fit holes and slots regardless of the respective positions of the plates —an indication of the extreme production accuracy possible with the HYDROPTIC-B.



Proof of Ultra-precision!

Production of small quantity lots is both practical and economical on the HYDROPTIC-B. This Machine features exclusive Optical Measuring Microscopes for table and spindle settings, and readings may be taken on the verniers to 0.0001". Machine may also be used as a measuring instrument.

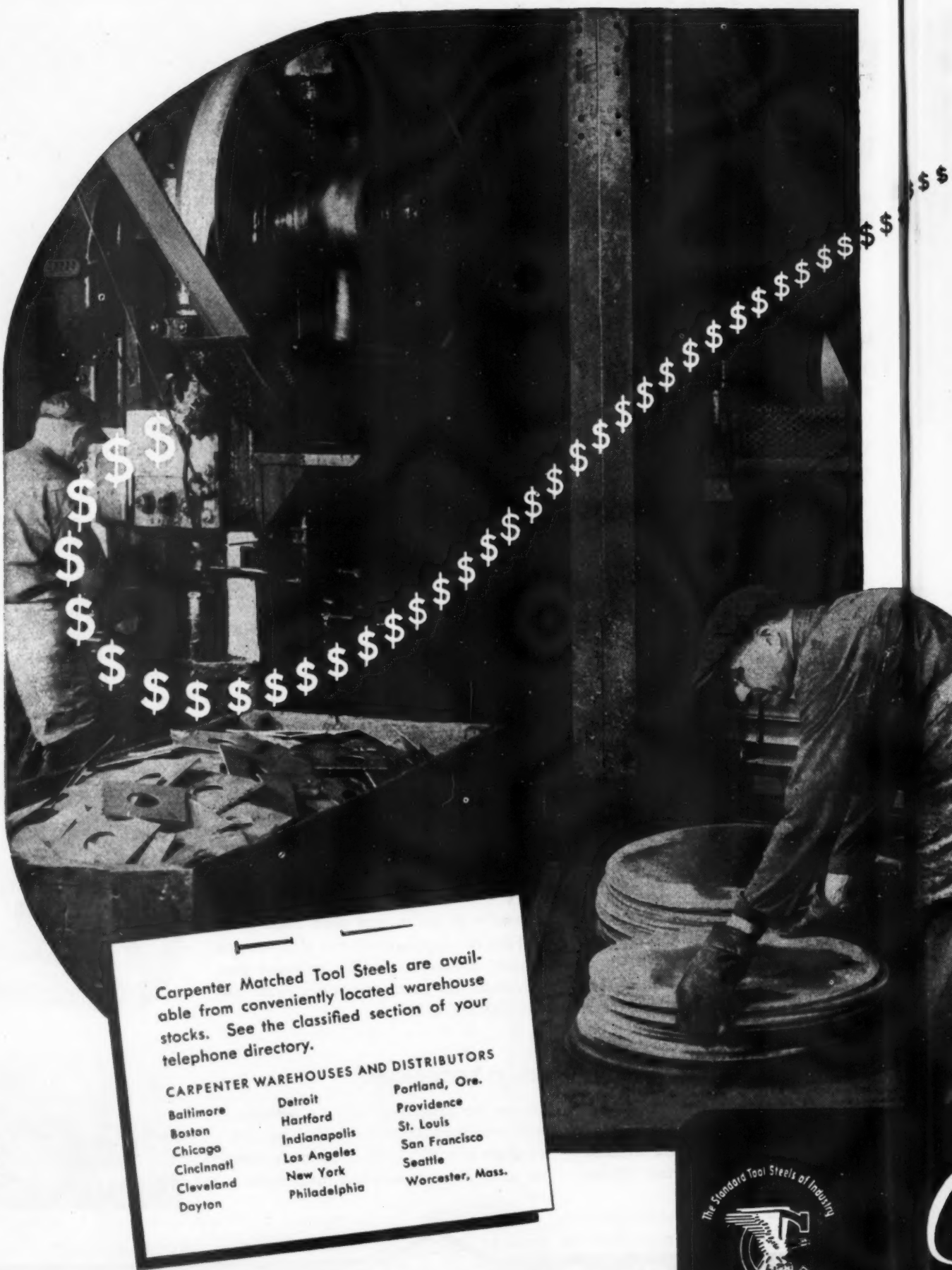


HIGH PRECISION MACHINE TOOLS AND MEASURING INSTRUMENTS

COSA CORPORATION

COSA

CHRYSLER BUILDING
New York 17, New York



Carpenter Matched Tool Steels are available from conveniently located warehouse stocks. See the classified section of your telephone directory.

CARPENTER WAREHOUSES AND DISTRIBUTORS

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Seattle
Worcester, Mass.

The Standard Tool Steels of Industry

How Your TOOLS & DIES Can Save You EXTRA DOLLARS Every Month

$ $ $ $ $ $

Tooling costs go down when you put this 3-step *job analysis* plan to work. Watch production costs drop as machines and presses stay on the job more hours every month. Use these three steps to stop the loss from tools that wear too rapidly or fail prematurely.

1. Plan Tool Performance Before Tools Are Made

Now you can spot the way to more wear resistance, greater hardening accuracy or greater toughness in a tool. With the Carpenter Matched Set Method you can get tools that reduce costs by staying on the job longer. Put it to work now by using the 167-page Matched Tool Steel Manual. It shows you how to save time, tool steel and money in solving over 90% of your tool room problems. The Manual is free to tool steel users in the U. S. A., so for your copy drop us a note on your company letterhead.

2. Take This Step to Better Heat Treating Results

Proper heat treatment is the second step to better tools that cut costs. To get the heat treating results you want, use the "Matched Tool Steel Manual". It contains the most complete heat treating information available in printed form. And as a special help to your heat treaters, we have prepared a handy slide chart that condenses the basic heat treating information and puts it in easy-to-use form. Drop us a line and let us know how many Carpenter heat treating slide charts you will need.

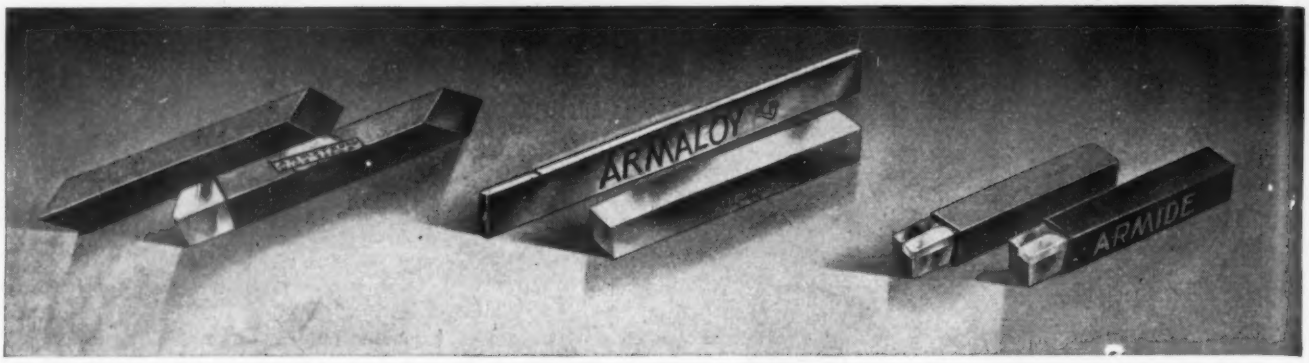
3. Check Costs By Output Per Grind

In the competitive days ahead, costs will have to be cut. But, cost skyrocket and output slumps when tools fail prematurely in service or need too frequent regrinding. So keep a record of the results from each tool set-up and use it as a guide to get more output, lower costs. And if you want shop help with new tool steel problems, call your nearby Carpenter representative. He can work with you to reduce costs all along the line.

THE CARPENTER STEEL COMPANY · 109 W. Bern St., Reading, Pa.

Carpenter MATCHED TOOL STEELS

ARMSTRONG



100-150 f.p.m. **200-300 f.p.m.** **300-600 f.p.m.**

Whatever the Cutting Speed . . .

ARMSTRONG TURNING TOOLS
for High Speed Bits

ARMSTRONG CA Tool Holders for
ARMALOY Bits

ARMSTRONG Tool Holders
for ARMIDE Cutters

Whatever cutting speed an operation calls for there is a correct ARMSTRONG TOOL HOLDER that takes the proper bits, blades or cutter to do the operation economically and efficiently.

ARMSTRONG HIGH SPEED

For general tool room and machine shop use, ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

ARMALOY

ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-fitted castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

ARMIDE

ARMIDE Carbide-Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVENUE **CHICAGO 12, U. S. A.**

Eastern Warehouse & Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Warehouse & Sales Office: 1275 Mission St., San Francisco 3, California

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

COLLETS

Guaranteed * TO RUN DEAD TRUE

Work held in a Rivett Collet is guaranteed to run "dead true" at the Collet mouth and within .002" two inches from the Collet mouth. Rivett Draw-In Collets are available in all standard styles for bench lathe, engine lathe, miller and grinder use.

They have personality derived from a worthy inheritance and a steadily improved environment. When shipped, each Rivett Collet reflects more than fifty years of Collet manufacturing "know-how" and the most advanced machining and inspection.

See how the individual cartons permit you to read easily through the "window" the style, size and Rivett name. This distinctive packaging provides protective storage with absolute identification.

* For complete information on all Rivett Collets and their adaptation to existing machines write for Bulletin 100C.

RIVE
SPRING TEMPER
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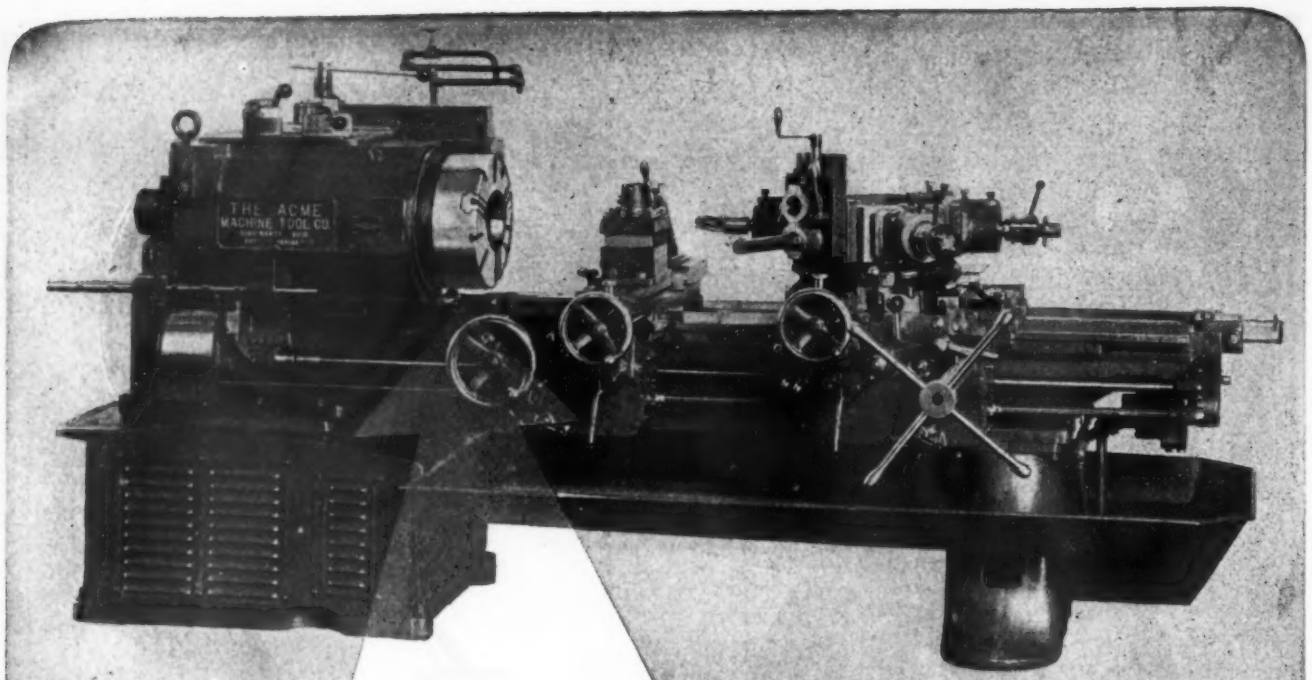
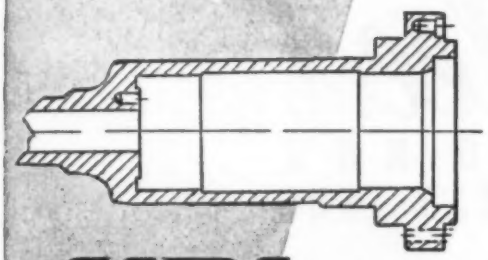




ACME *gives greater spindle capacity*

Now you can profit from increased versatility in this deep throat Acme Universal Turret Lathe. Designed especially to machine those forgings, tubings and similar large diameter pieces requiring a deeper throat and greater chuck capacity, this Acme Turret Lathe is a welcome addition to your plant.

This machine, likewise, includes a triple roller bearing spindle and brake, hardened steel vees, extended square turret cross slide and rear tool post, and rapid power traverse for longitudinal movement of the hexagon turret. All moving parts run in an oil.bath.

We'll be pleased to furnish you specific information at your request.

The ACME MACHINE TOOL Co.
CINCINNATI 32, OHIO

Some reconversion will come in drums

While you're re-tooling and setting up schedules for peacetime production, it will pay you to have an Ohio Oil Company lubrication engineer make a thorough check of all the oils used in your metal working operations.

You may find that there's a better oil for the new metals you'll be working with. Or you may discover a better type for certain job classifications that you haven't had in the shop throughout the war.

The Ohio Oil Company has built up a backlog of wartime experience on the use of certain new types of oils, as well as work studies on new applications of certain Marathon accepted favorites.

In addition, The Ohio Oil Company has carried on, and continues to carry on, accelerated research to anticipate cutting and grinding problems and have the answers ready in advance. This intensive research may hold important answers to problems which will crop up in the varied and often complicated products your peacetime buyers will be ordering.

Ask an Ohio Oil Company lubrication engineer to come in for a thorough lubricant check, now. He will be glad to offer his recommendations and call back regularly to bring you the benefits of Ohio Oil lubrication research. Just write, wire or phone.

A COMPLETE LINE OF CUTTING AND GRINDING OILS FOR EVERY METAL WORKING OPERATION

MARATHON

THE OHIO OIL COMPANY

Producers of Petroleum Since 1887

GENERAL OFFICES: FINDLAY, OHIO

District Offices: Robinson, Ill., Indianapolis, Ind., Louisville, Ky.

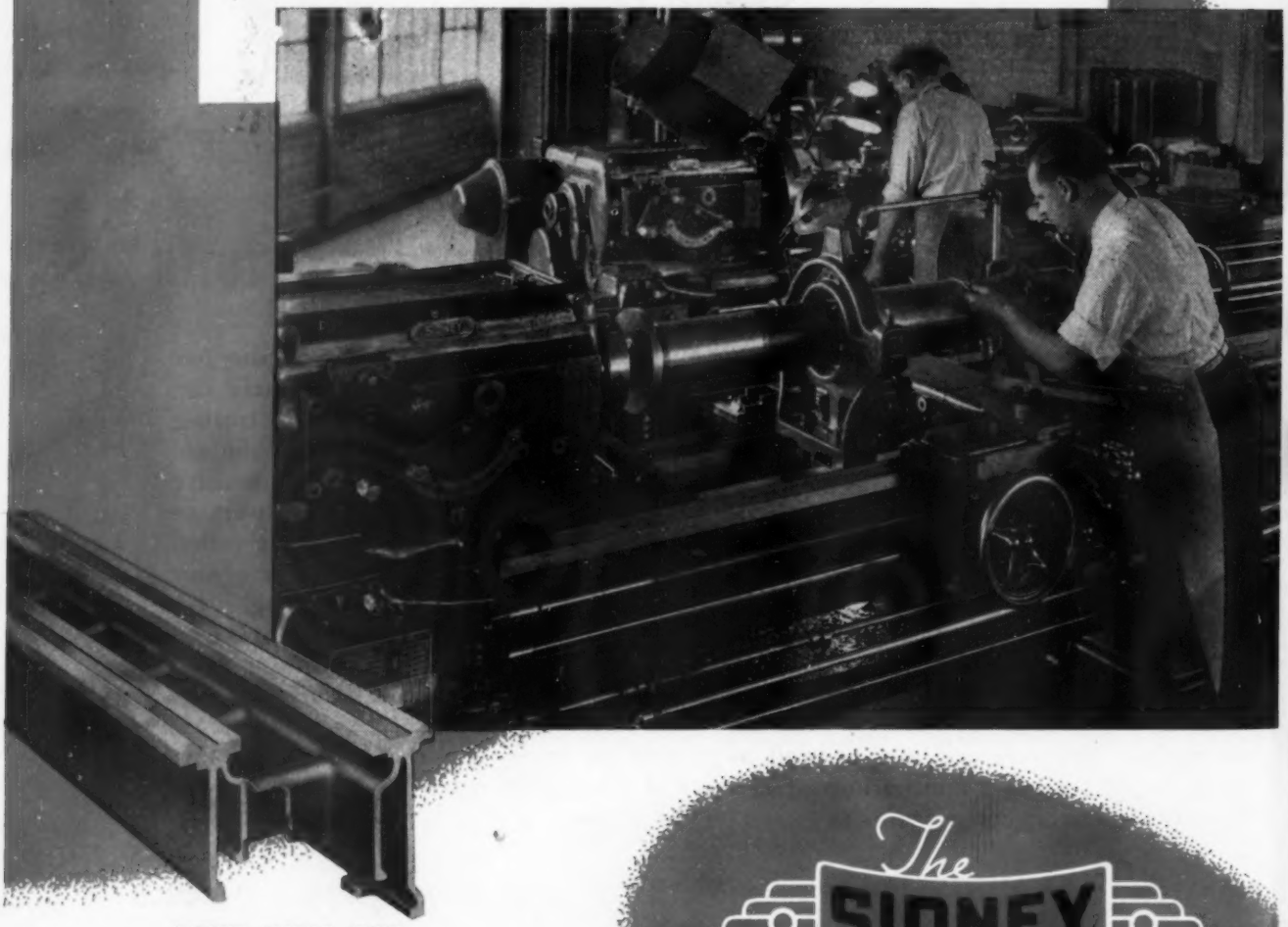
Versatility IS ANOTHER ASSET OF SIDNEY LATHES

● The wide range of work handled by Sidney Lathes is clearly illustrated in the accompanying illustration where two distinctly different jobs are being machined—one on a 20 inch lathe, the other on a 16 inch lathe.

Dependable accuracy is maintained on all jobs by means of the smooth flow of power to spindle thru the continuous tooth herringbone geared head and rigidity of construction which starts with the Sidney four wall bed design.

Ease of control—16 spindle speeds in geometrical progression—a wide range of thread and feed changes provide the versatility that makes the Sidney Lathe a profitable production unit in hundreds of plants.

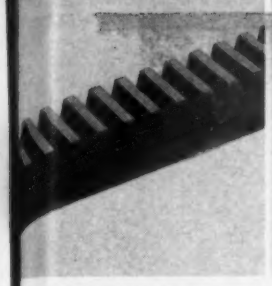
For ultimate economy on your lathe operations specify Sidney. Bulletins on all sizes available.



FOUR WALL BED

The Sidney Lathe bed is designed for permanent accuracy under heaviest service. The four wall construction with cross girts at 12 inch intervals gives correct metal distribution and greater resistance to deflections and twisting strains. The two well proportioned outside Vee ways have greater bearing area to take down thrusts and accurately guide the carriage while the inside Vee ways and flat control head and tailstock alignment.

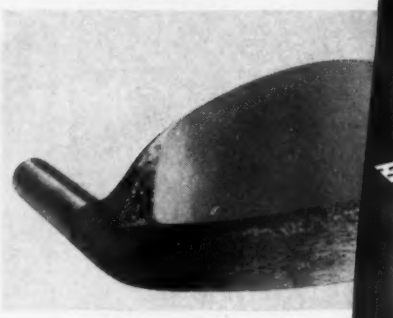
The SIDNEY MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY . OHIO
ESTABLISHED 1904



Broach Rack Teeth

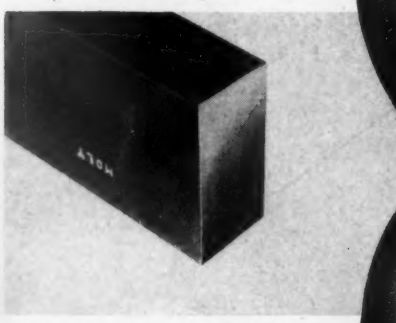
Straddle Broach

Broach "Tee" Slot



Form Broach

Grooves and Slots

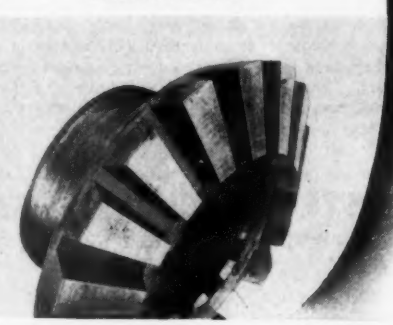


Broach Shafts and Blocks to Length

(Index Fixture used)

Broach Serrations

Form Broach



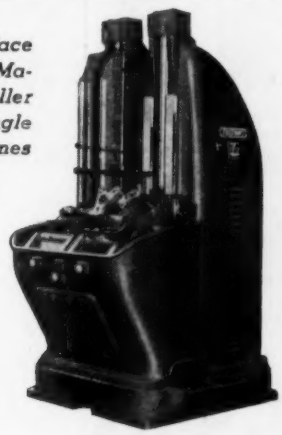
Rough Bevel Gear Teeth

10 WAYS TO USE *Surface Broaching*

Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. If you have a part that you think can be surface broached, send blueprints and production requirements. We will be glad to make our recommendations on Footburt Surface Broaching Machines based on our many years of experience in handling similar work.

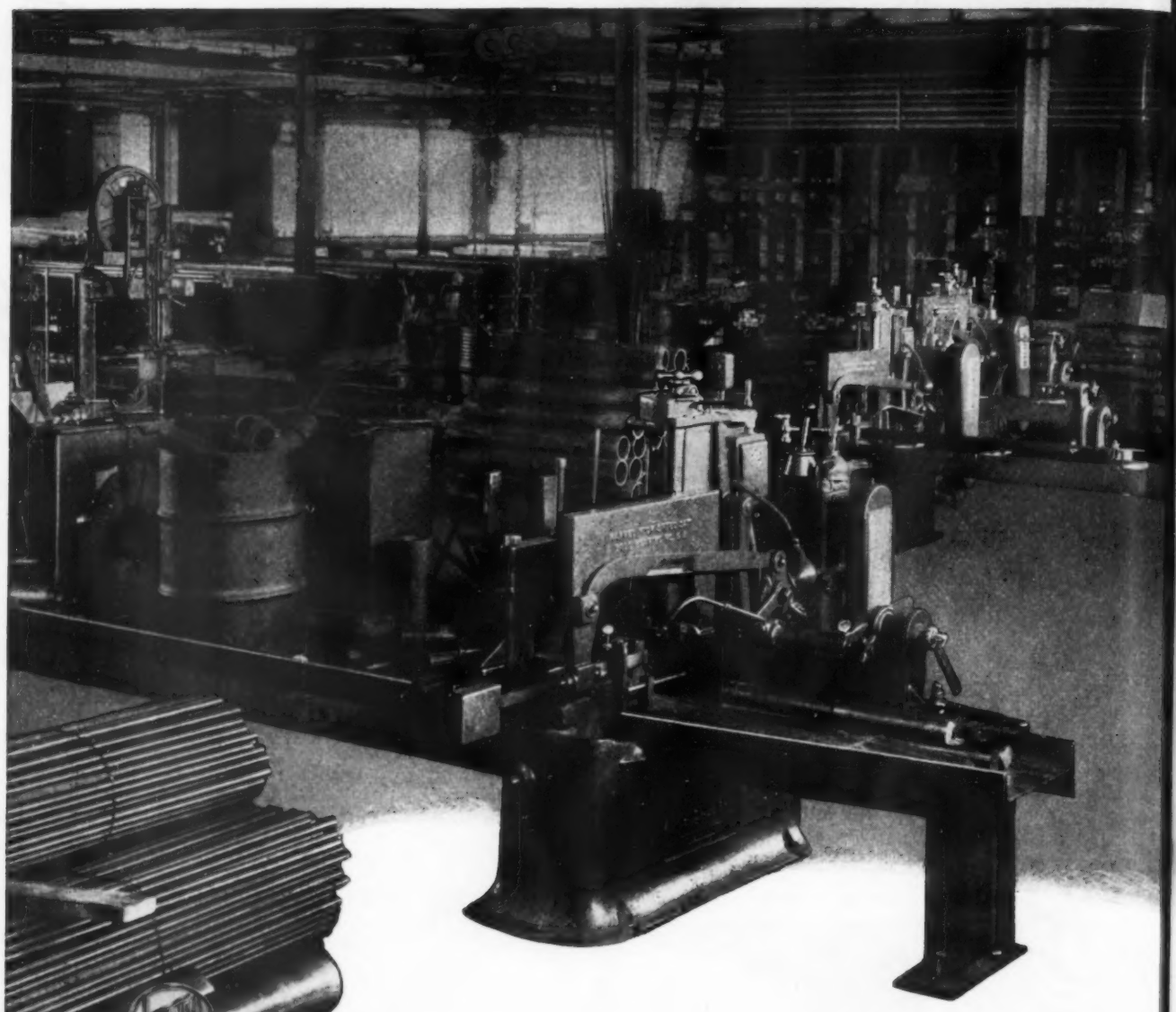
THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building

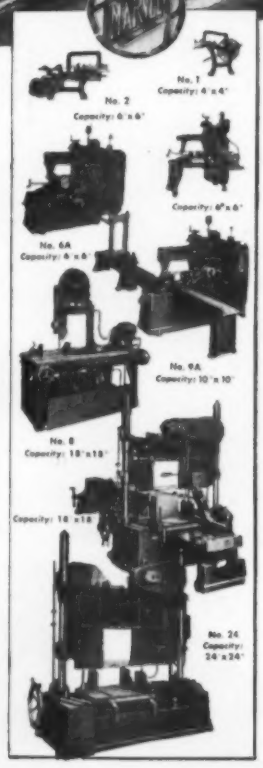
Duplex Surface Broaching Machine. Smaller sizes and single slide machines available.



Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*





FASTEST SAWS GIVE FASTEST SERVICE

With these four modern MARVEL SAWS, the Hamilton Steel Co. of Cleveland is building a reputation for fast service on orders for accurately cut lengths and pieces. They use a Universal No. 8 MARVEL Metal-cutting Band Saw for the big work (up to 18" x 18"), for angle cuts (at any angle in a 180° radius), for knotching, mitering and roughing to size and shape. For high speed cutting-off from bar stock up to 10" x 10", they have three No. 9A MARVEL Production Saws. These "fastest saws built" are used for cutting-off single pieces, or with their automatic bar-push-ups, for automatically reducing single or nested bars to slices (as gear blanks) or identical lengths, faster than is possible, with equal accuracy by any other method.

With 9 distinct types of MARVEL Metal-cutting Saws; with the positively unbreakable MARVEL High-Speed-Edge Hack Saw Blades; and, with MARVEL Band Saw Blades, the MARVEL System of Metal Sawing has a better way for doing innumerable metal-cutting jobs. If you have a difficult metal sawing problem or just want a saw, MARVEL is your logical source.

Write us or check with your local MARVEL Distributor.

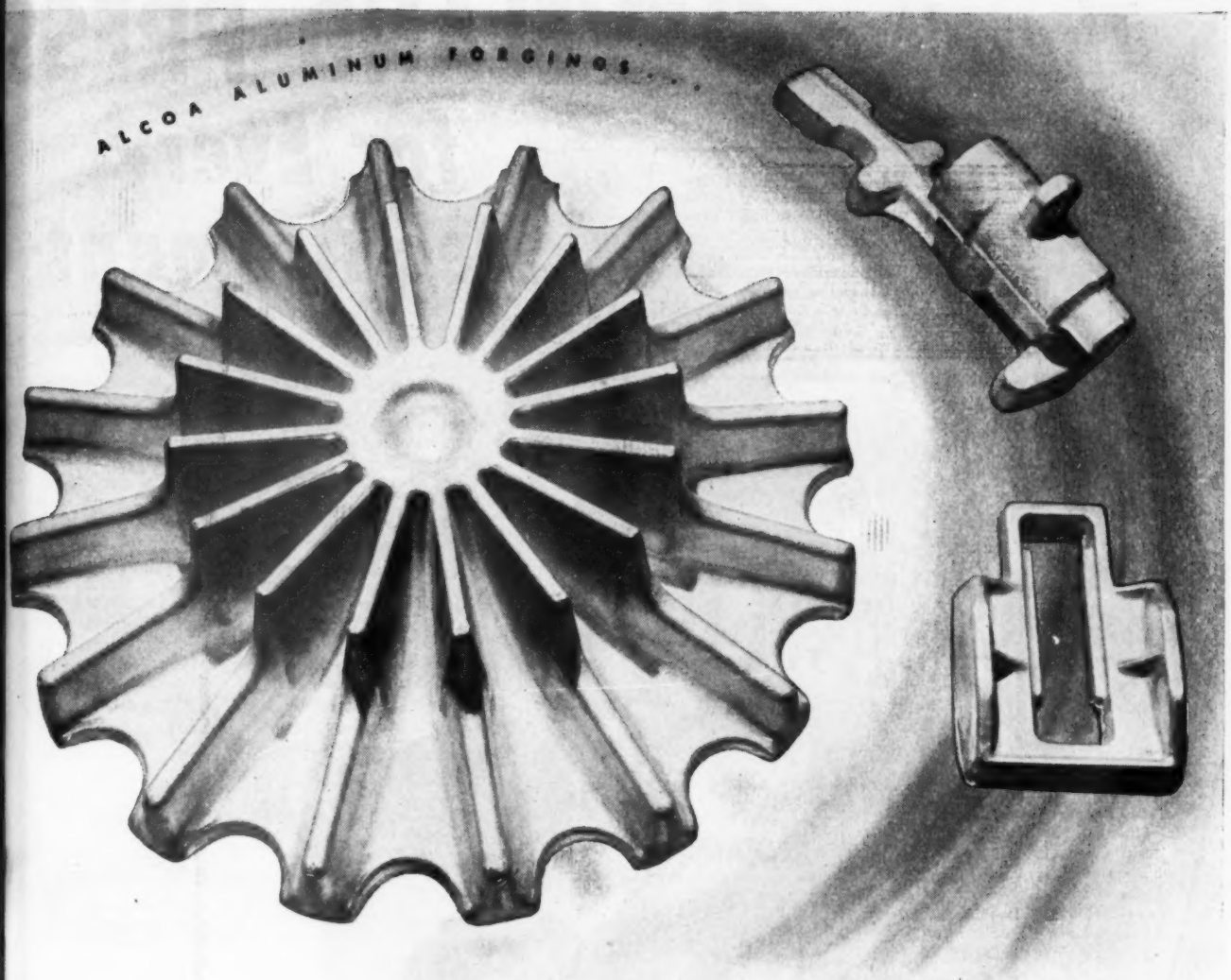
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 BLOOMINGDALE AVE. **CHICAGO 39, U.S.A.**

Eastern Sales Office: 225 LAFAYETTE ST., NEW YORK 12, N. Y.

MARVEL SAWS



THERE'S Strength THERE

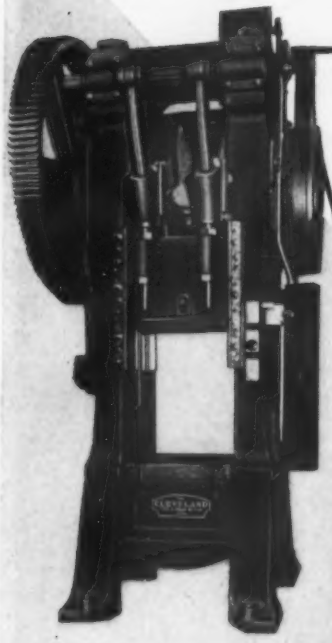
STRENGTH to withstand the strains of high centrifugal speeds, the steady pull or the alternating load—STRENGTH which translates itself into great DEPENDABILITY—STRENGTH with the LIGHTNESS that's inherent in aluminum.

These are the properties accounting for the widespread use of Alcoa Aluminum forgings in so many warplane applications.

Large aluminum forgings and small, many with complicated shapes, are being produced in tremendous numbers by Alcoa. They're setting the pace for new and improved postwar products—lighter, stronger, more dependable. Alcoa Aluminum forgings may help you accomplish the same results. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.

ALCOA FIRST IN **ALUMINUM**

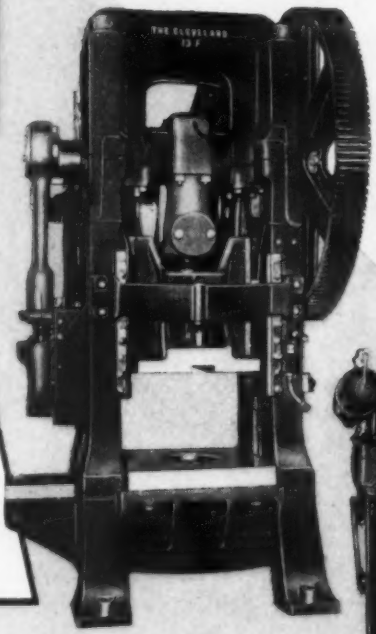
There's a CLEVELAND PRESS for Every Requirement



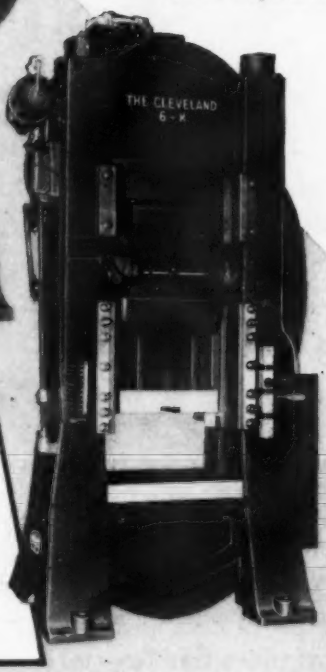
Cleveland 12 T Single Crank Double Action Toggle Press. The inner slide has a capacity of 130 tons, stroke 16" and a bed area 28"x 26". The outer, or blankholder slide has a capacity of 80 tons, and a 10" stroke. The Press is equipped with an electrically controlled air friction clutch.

Because no one particular type of Power Press is suitable for the economical production of the many and varied pressed metal parts used in the manufacture of home appliances, automobiles, industrial equipment and numberless other products, we build no less than twelve different types of Presses including: Inclinable, Horning, Punch Type, Open Back Gap, Trimming, Knuckle Joint, Double Action Toggle, Single Point, Two Point and Four Point, in a wide range of sizes and capacities.

Therefore, before installing any Mechanical Power Presses, we suggest that you afford our Engineers the opportunity to submit recommendations which will be made solely on the basis of the most suitable type of Press for your particular requirements.

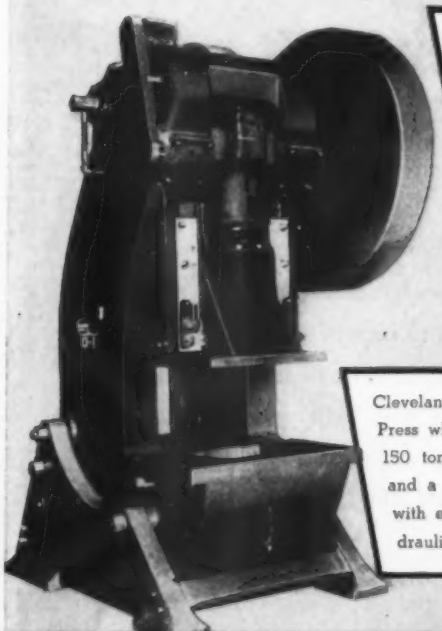


Cleveland 13 F Forging Press with inner and outer slides. The inner slide has a stroke of 6" and a bed area 40"x 32" while the outer slide has a stroke of 3" and a bed area 16"x 16". Capacity 150 tons. This press is equipped with electrically controlled air friction clutch.

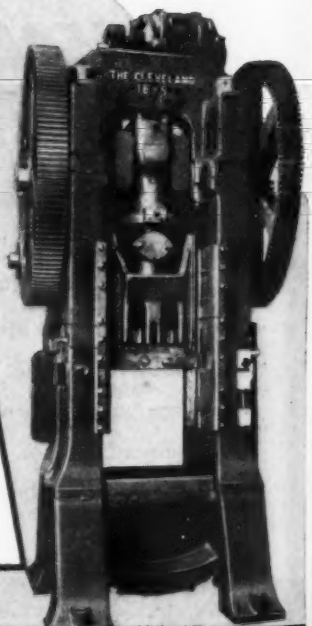


THE CLEVELAND PUNCH & SHEAR WK'S CO. U.S.A.

Cleveland 6 K Knuckle Joint Press, Capacity 600 tons, stroke 5", bed area 35"x 36" equipped with single station electrically controlled air operated friction clutch and brake.



Cleveland Inclinable Open Back Press which has a capacity of 150 tons, bed area 30"x 45" and a stroke of 6", equipped with electrically controlled hydraulic friction clutch.



Cleveland Straight Sided Single Crank Press, capacity 250 tons, stroke 18", adjustment 5", bed area 30"x 30", equipped with air operated friction clutch, single station control.

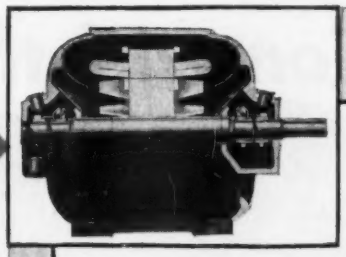
THE CLEVELAND PUNCH & SHEAR WORKS CO. CLEVELAND 14, OHIO

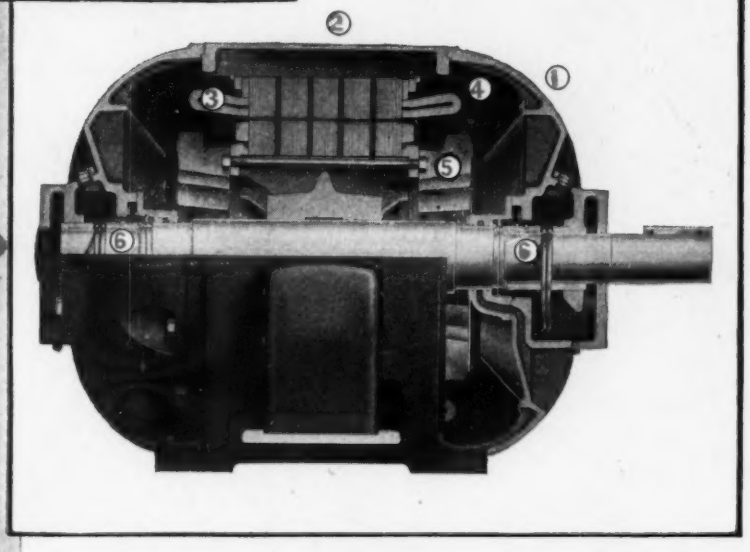
NEW YORK CHICAGO DETROIT PITTSBURGH PHILADELPHIA

SAME STRONG POINTS OF CONSTRUCTION

from 1 hp

to 2000 hp





Now all your drives — large and small — can have standard G-E Tri-Clad induction motors with the famous protective features that guard against PHYSICAL DAMAGE, ELECTRICAL BREAKDOWN, OPERATING WEAR AND TEAR.

Tri-Clad, in its wide range of types and sizes (recently increased to 2000 hp), is G.E.'s most widely used (integral-hp) motor. For complete details on ratings, characteristics, and dimensions, write for Bulletin GEA-3580. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
Tri-Clad Type K (Low starting current, normal starting torque)	1 hp to 2000 hp at 1800 rpm
Tri-Clad Type KG (High starting torque, low starting current)	5 hp to 200 hp at 1800 rpm
Tri-Clad Type KR (High starting torque, high slip)	Available to 100 hp in speeds required for high-slip flywheel drive (punch press, etc.)

① Cast-iron frame and rigid, cast-iron end shields protect the motor from external blows and accidental abuse.

② Completely enclosed upper portion of frame guards against entry of falling objects and dripping liquids; keeps chips and the like from vital motor parts.

③ Windings of Formex* wire—one of the toughest magnet wires yet developed—resist heat aging, heat shock, and abrasion.

④ End windings are coated with Glyptal* varnish, providing a tough, hard finish that withstands moisture, oil, and abrasion.

⑤ Low-velocity, double-end ventilating system keeps the motor running cool and prolongs insulation life. One-piece, cast-aluminum rotor (used on all but the largest sizes), with integrally cast fans, is practically indestructible.

⑥ Bearings have extra capacity to take heavy shaft loadings from any direction. Lubrication is convenient, its effectiveness well proved.

*Trade-mark reg. U. S. Pat. Off.

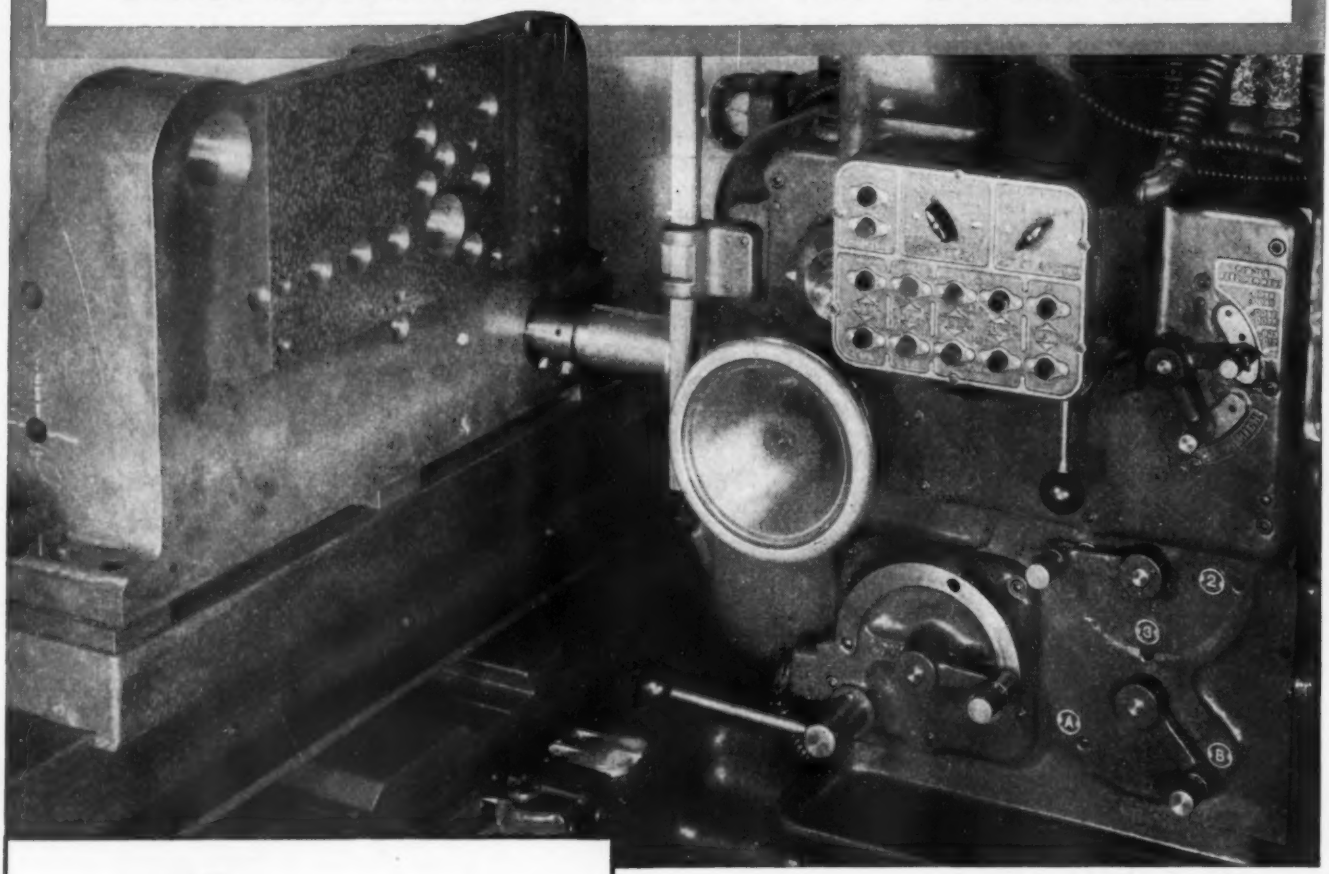
TRI CLAD MOTORS

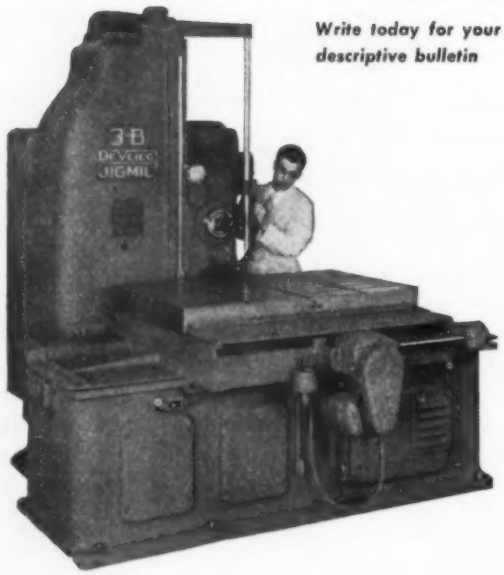
Buy all the BONDS you can — and keep all you buy

TRI-CLAD-5012G

GENERAL ELECTRIC

You get Excellent Operator Coordination with the JIGMIL





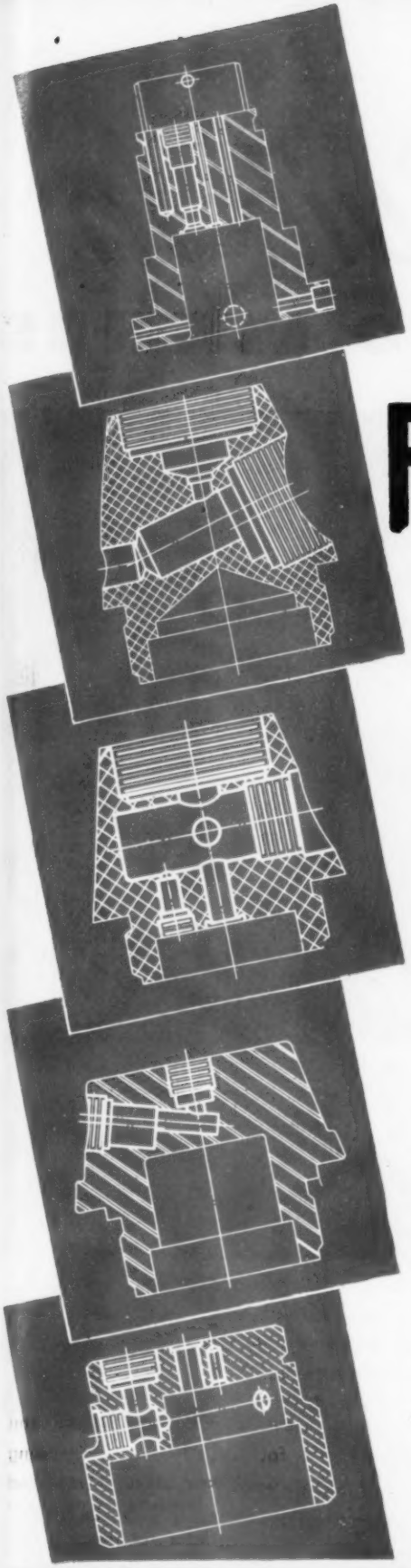
Write today for your descriptive bulletin

All Bar Functions Can Be Performed With The Operator's Continual Visual Attention To The Cutting Tool

Excellent operator coordination is made possible through the simplicity of the controls. The effortless ease with which the many functions are quickly and accurately responsive to any operator need is a dominant factor in the high productivity of the DeVlieg JIGMIL.

The bar movement has a screw actuated power feed and rapid traverse, responsive to a four-position lever, extending down from a master switch. A wheel is provided for hand operation and a micrometer dial for accurate depth control. *Users report two to three times the output and greatly increased accuracy.*

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**



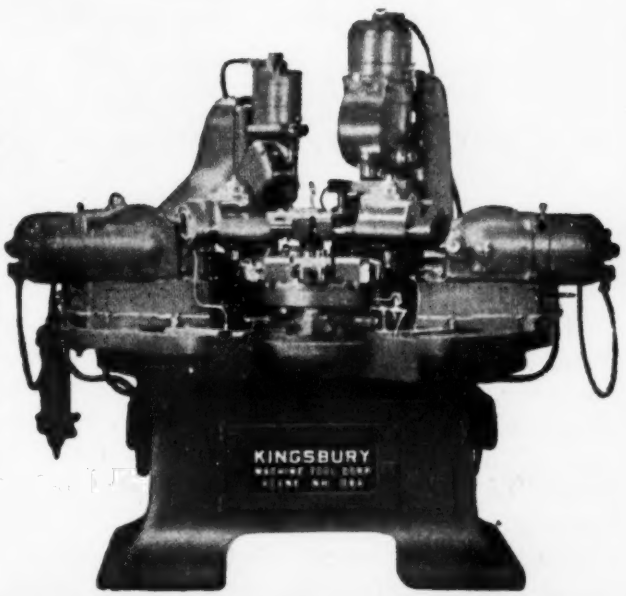
Intricate Fuse Parts Produced with Minimum Number of Chuckings

FLEXIMATIC

by KINGSBURY

The blanks for these shell fuse parts are taken from automatics and completed in from one to four handlings. Kingsbury FLEXIMATICS make it possible to perform in a single chucking a dozen or more highly intricate machining operations on fuse and rifle components and similar parts where speed and accuracy are essential. Post war production presents a three-fold problem . . . high standards of accuracy, pressing production demands and low cost per part produced. Kingsbury FLEXIMATICS provide—in a single machine—the efficient means to solve all three phases of your present and future production problems.

The FLEXIMATIC system of construction consists of Standard Units for drilling, tapping, boring, reaming, spot-facing, etc. Mounted on one of several standard bases. This unique method provides a flexible set-up which can be changed over to meet the machining requirements of many different parts.

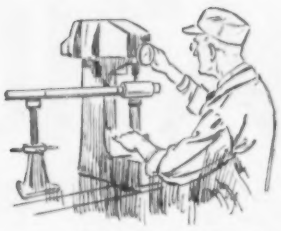


KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

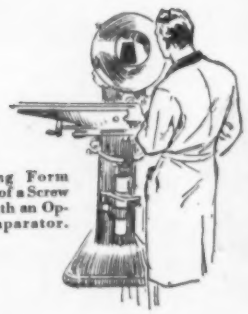
Testing Saddle Cross Slide Dovetail for Squareness with Lathe Bed Ways.

PRECISION IS *Built In* IN SOUTH BEND LATHES



Testing the Hardness of a Carburized Headstock Spindle Bearing Surface.

Checking a Fixture with Precision Gauges.



Inspecting Form and Lead of a Screw Thread with an Optical Comparator.

The "built-in" precision of South Bend Lathes, so evident in their performance, has its source not only in their design features, but in every vital part. Each part has behind it the experience of thirty-eight years of lathe building, plus constant research directed towards its improvement. Backing this up in every manufacturing process are rigid controls that prevent deviations from established standards. These are a few of the reasons why South Bend Lathes are better today in every way.

This "built-in" precision makes possible heavier cuts and feeds, easier operation, longer life, and greater accuracy. It pays dividends to the users of these lathes in better and faster machining. Examine your metal working requirements in view of the advantages that can be obtained through the use of South Bend Lathes.

Write for
NEW LATHE CATALOG 100-D

Illustrates and describes all South Bend Lathes. Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swings. Precision Turret Lathes with ½" and 1" collet capacities.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

LATHE BUILDERS FOR 39 YEARS

Mazlo Magnesium

HAS EXCELLENT MACHINABILITY

TURNING AND BORING

MILLING

SHAPING

DRILLING

TABLE I
SPEEDS AND FEEDS RECOMMENDED FOR MACHINING MAGNESIUM ALLOYS

Type of Operation		Speed Feet/Minute	Feed In./Blade/ Revolution	Max. Depth of Cut, In.
Turning and Boring	Roughing	Up to 1000	.030—.100	.50
		1000—2000	.010—.045	.30
		2000—5000	.010—.030	.15
	Finishing	Up to 1000	.005—.025	.10
		1000—5000	.003—.015	.05
Milling	Roughing	Up to 1000	.005—.025	.50
		1000—2000	.005—.020	.30
		2000—5000	.005—.010	.15
	Finishing	Up to 1000	.005—.015	.07
		1000—5000	.003—.010	.05
Shaping	Roughing	Up to 150	Inch/Stroke Up to .25	.50
	Finishing	Up to 150	Up to .25	.25
Drilling	¼-in. dia.	100 and over	Inch/Revolution .005—.030 (1)	
	1-inch dia.	100 and over	.020—.050 (1)	

(1) Applies to hole depths up to five diameters. For longer holes, the recommended ranges are .004 to .008 for ¼-inch diameter, and .015 to .030 for 1-inch diameter.

Men in the shop like to work with Mazlo Magnesium alloys. Their machines can hum at top speed, take big bites, maintain close tolerances and leave a fine finish.

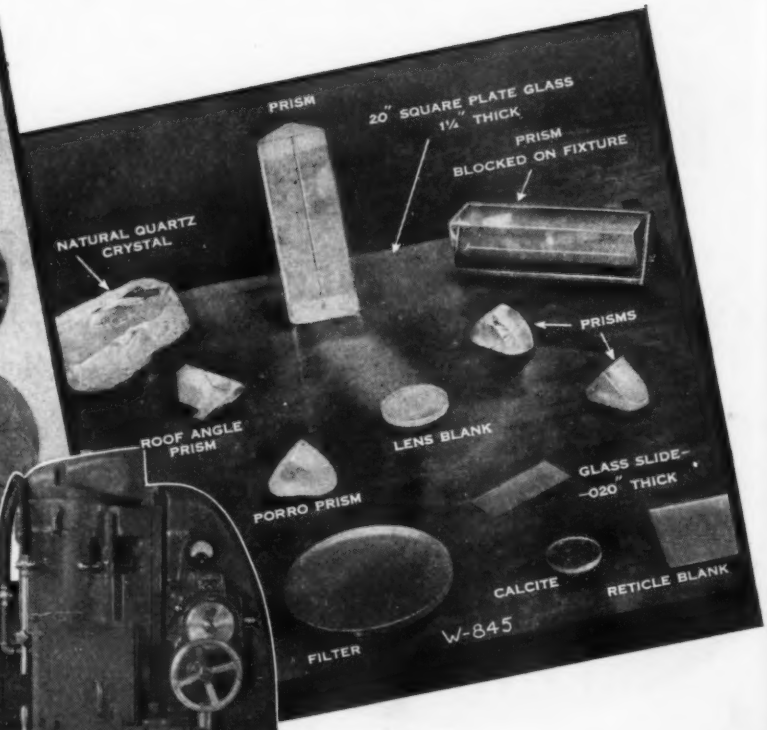
When a magnesium part needs a lot of machining, the saving in cost, compared to other metals, is substantially greater. Often, only the limitations of the machines themselves determine how fast parts can be turned out. Maximum production is assured.

You'll find excellent machining characteristics in Mazlo Magnesium sand castings, permanent-mold and die castings, forgings, extruded shapes and plate. For information on magnesium products, write the Aluminum Company of America (Sales Agent of Mazlo Magnesium Products) 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

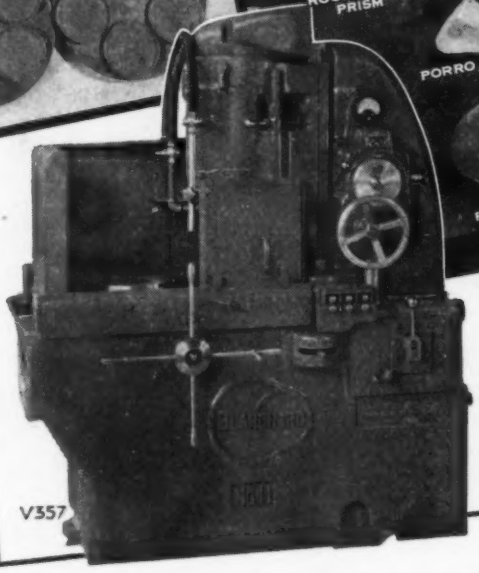
MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

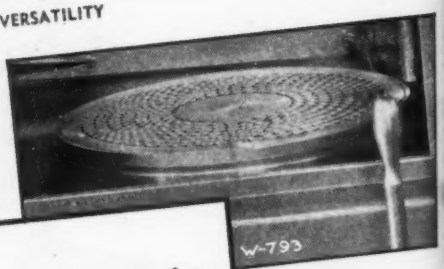
SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

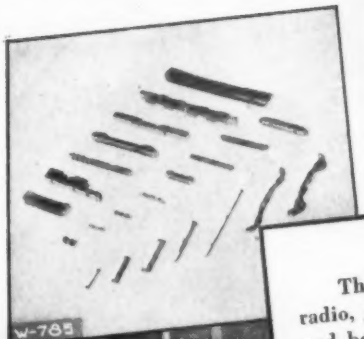


ACCURACY
with
HIGH PRODUCTION



VERSATILITY

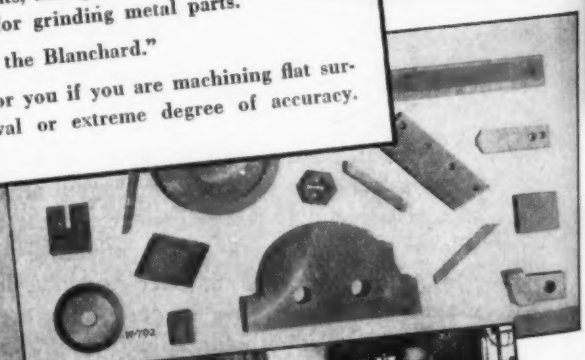


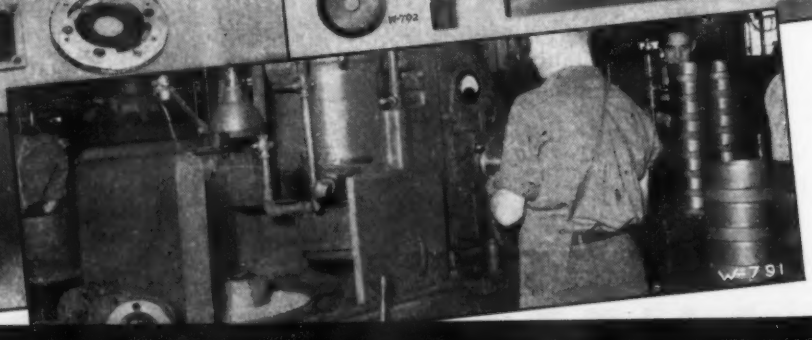


The Blanchard which has been grinding quartz crystals and ceramics for radio, jewel bearings for airplane instruments, and glass prisms for binoculars and bomb sights, was originally designed for grinding metal parts.

Send for free copy of "Work Done on the Blanchard."

It contains valuable production data for you if you are machining flat surfaces involving either rapid stock removal or extreme degree of accuracy.





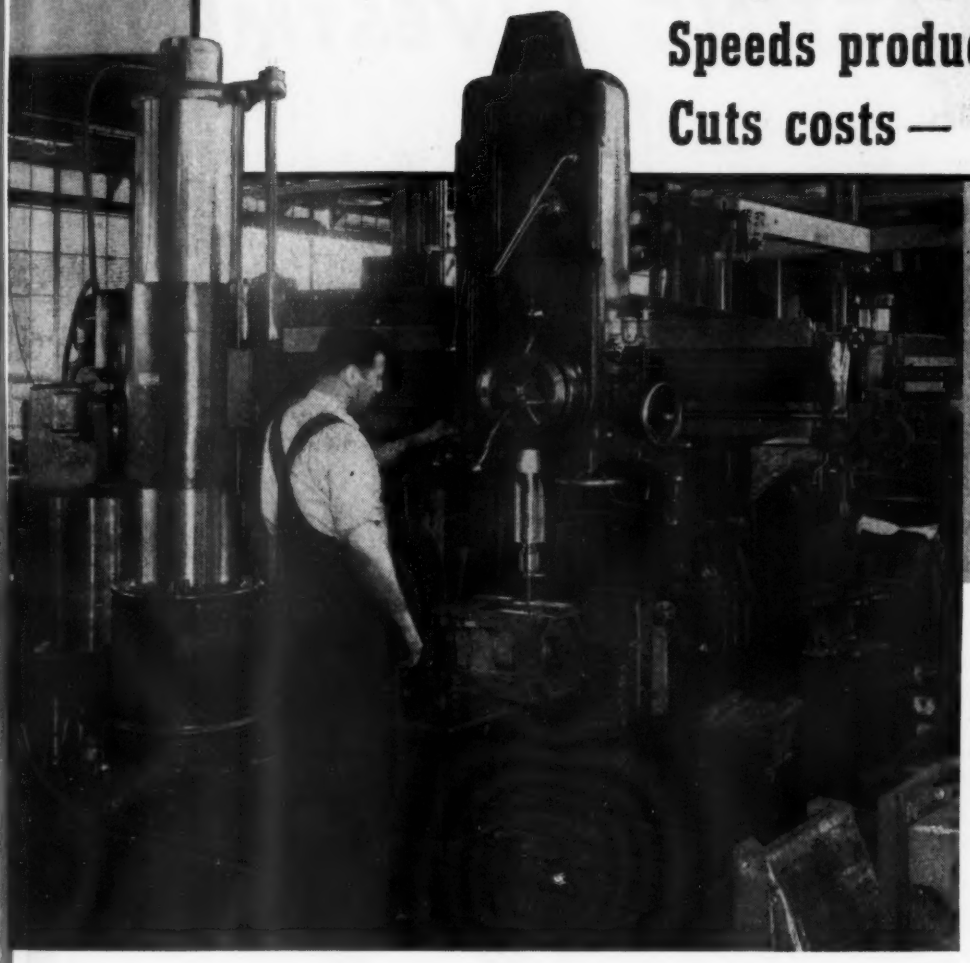
BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

Centralized Hydraulic Control—

Simplifies operations—
Speeds production—
Cuts costs—



FOSDICK RADIAL

● Drilling holes of various diameters at various center distances at one setting is one of the advantages of a Radial Drill.

Add to this the full hydraulic control of all the principal functions of the machine from the operator's normal working position—plus a full range of feeds and speeds in the head and you have a few of the many advantages offered in Fosdick Radial Drills.

The job illustrated is typical. Here a Fosdick Radial is drilling several holes in a machine casting without resetting. Operator has full control of all feed and speed changes at his finger tips.

Put your next radial job on a Fosdick—for precision—speed—and low costs.

Full descriptive bulletin available. Write for Fosdick Hydraulic Radial Bulletin R. A.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

HALLOWELL BENCHES of STEEL ARE A *LASTING INVESTMENT!*

Smooth, flat tops . . . Always Available

Sturdy, rigid construction . . . makes them last a lifetime.

Come in 5 heights 7 sturdy lengths And 1300 ready made interchangeable combinations

Flexibility of arrangement distinguishes "Hallowell" Benches. Use them separately or, as shown, end-to-end to form a long, smooth, continuous top! The "Hallowell" in the cut was later dismantled and its sections, all standardized, rebuilt at minimum cost into a multitude of individual steel benches distributed throughout the shop.

Fig. 732
Pat'd and
Pats. Pend.
Drawer is extra

COMPLETE CATALOG

FREE ON REQUEST.
Full description and prices of all the "Hallowell" models.

Write now!

List your wants in work benches . . . and then find them all anticipated in the Time——and Money-saving features of "Hallowell" ready-made Benches. Sturdy steel construction assures *permanent* rigidity *without* costly bolting to the floor. You can forget about designs of your own, lumber and labor costs for bench construction, too! Over 1300 ready-made combinations from which to choose assure the "custom-built" bench you want . . . a bench that will "stand up" under years of hardest wear. Choose "Hallowell" shop furniture for that feeling of "money well spent!"

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4

BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

OVER 40 YEARS IN BUSINESS

This kind of LIGHTING is costing you money!

Glare and insufficient light are costing you money here. Glare helps produce eye strain and fatigue causing errors and lowering employee efficiency. Proper inspection of polished metal surfaces is difficult unless a large area, uniform, high-illumination low-brightness light source is used. No wonder production lags under unshaded lamps which produce a glaring light with approximately 50% as much illumination as required.

This kind of LIGHTING is money in your pocket!

No more squinting or headaches caused by poor lighting. Here is the same job. G-E Fluorescent Lamps give a soft, cool, uniform high-level illumination. Glare is reduced to a minimum and there is plenty of light diffused over a large area to help make this difficult inspection job easier.

There's a G-E Lamp for every lighting need—and G-E engineers to help you use them best. Whatever your lighting problem, let G-E help you with its solution. Consult your G-E Lamp Supplier TODAY.

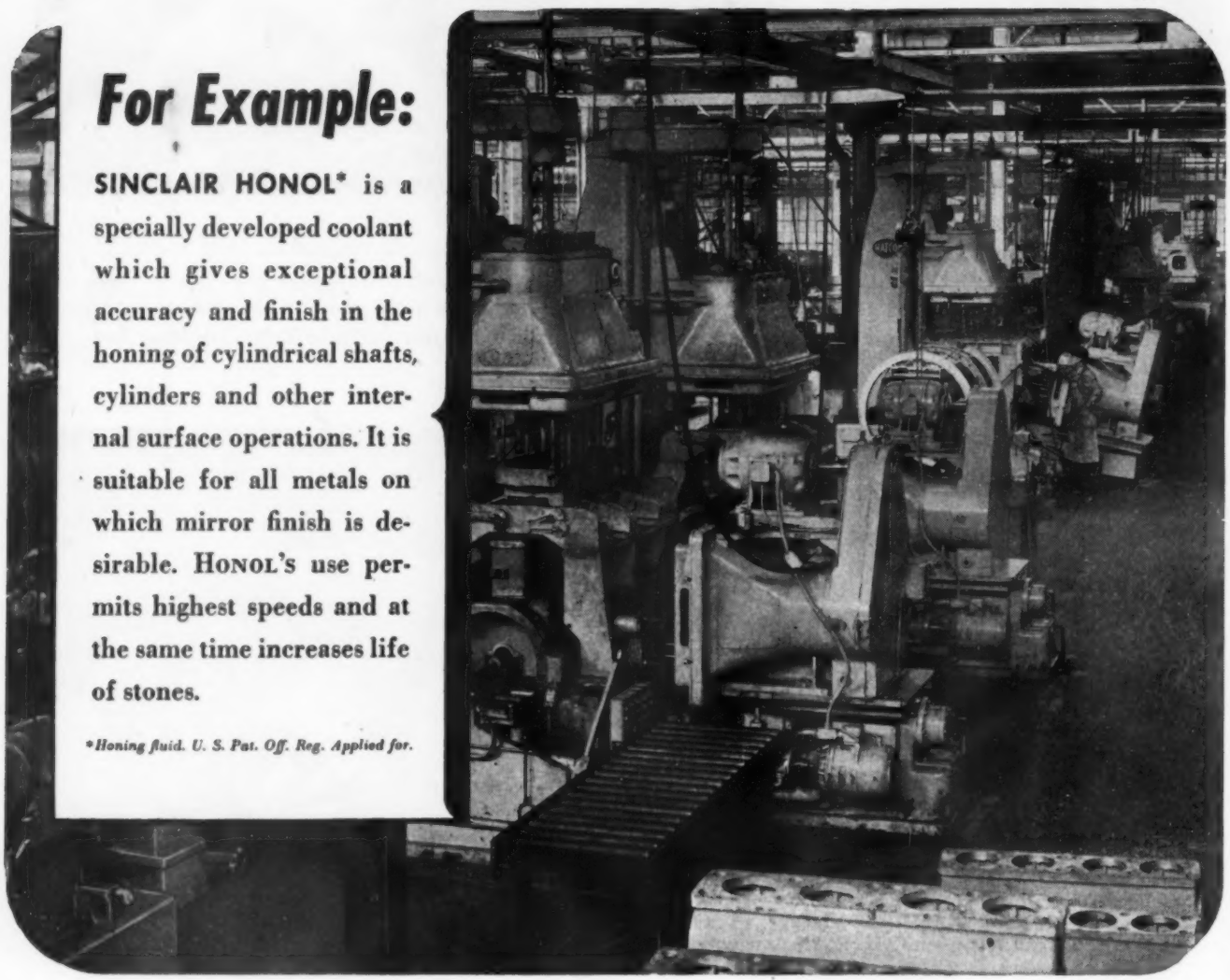
G·E LAMPS

GENERAL ELECTRIC

RESEARCH IS ALWAYS AT WORK TO IMPROVE G-E LAMPS AND MAKE THEM

STAY BRIGHTER LONGER!

SINCLAIR *has the Answers to Your Shop Problems . . .*



For Example:

SINCLAIR HONOL* is a specially developed coolant which gives exceptional accuracy and finish in the honing of cylindrical shafts, cylinders and other internal surface operations. It is suitable for all metals on which mirror finish is desirable. HONOL'S use permits highest speeds and at the same time increases life of stones.

**Honing fluid. U. S. Pat. Off. Reg. Applied for.*

OLDEST CRUDES MAKE FINEST LUBRICANTS

SINCLAIR provides a complete line of cutting and grinding fluids, both straight cutting oils and soluble oils. Have you a particular problem in maintaining production, or determining the correct cutting fluid for a specific operation? Sinclair consultants skilled in cutting operations and application of appropriate coolants are available to you.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

COMPLETE INFORMATION

ON THE P&W KELLERFLEX

Here at your fingertips you can have full details on all the different models and types of Pratt & Whitney KELLERFLEX Flexible Shaft Machines. In these pages are also described and illustrated the various handpieces, attachments and accessories that make the KELLERFLEX the machine of 1000 and 1 uses . . . the "most versatile machine in the shop." Write for this KELLERFLEX catalog now . . . simply fill out the coupon below, or drop us a note on your company letterhead. We feel sure this important information will show you many ways to speed up production and save money, as it is doing for hundreds of other shops.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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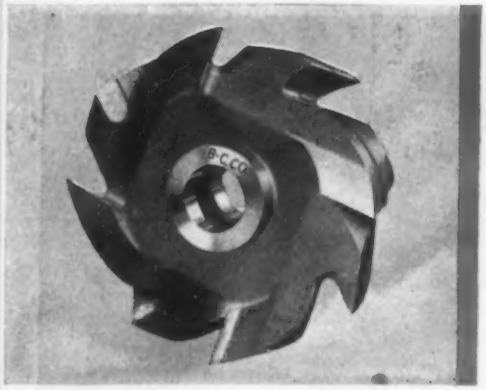
Gentlemen: Kindly mail me at once a copy of your KELLERFLEX catalog. This is free, of course.

Name and Title .....

Company .....

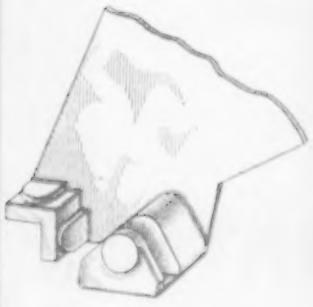
Address .....

.....



This cutter, designed for slotting magnesium, provides a free, continuous flow of chips across the face of the cutting teeth. A conventional style cutter may clog with chips under these conditions with resulting damage to finish of the work.

BARBER-COLMAN MILLING CUTTER ENGINEERS



The spray of chips is evidence of the high speed and efficiency with which metal is being removed on this soft magnesium bracket. For production data, see text below.

DESIGN DEEP SLOTTING CUTTER FOR HIGH-SPEED WORK IN MAGNESIUM

With the increasing use of magnesium and other light metals, many challenges have been presented to the skill and ingenuity of metal cutting machine and tool designers. One recent example, for which a highly successful solution was developed by Barber-Colman Milling Cutter Engineers, is shown here. A new style Barber-Colman interlocking cutter, patent No. 2,230,662 is used to mill a slot 1.138" wide x 1" deep x 2" long in a magnesium bracket. Cutter speed is 750 S.F.M. and feed 24" per minute, with cutting time ½ minute per slot. A larger cutter used simultaneously on the same arbor faces the lug on the end of the bracket. Cutter produces 300 pieces per sharpening. When your production calls for high-speed milling of light metals, call on Barber-Colman Engineers for long-lived, efficient cutters specially designed for the job.

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.

ON WORK BETWEEN 10" AND 20" IN DIAMETER

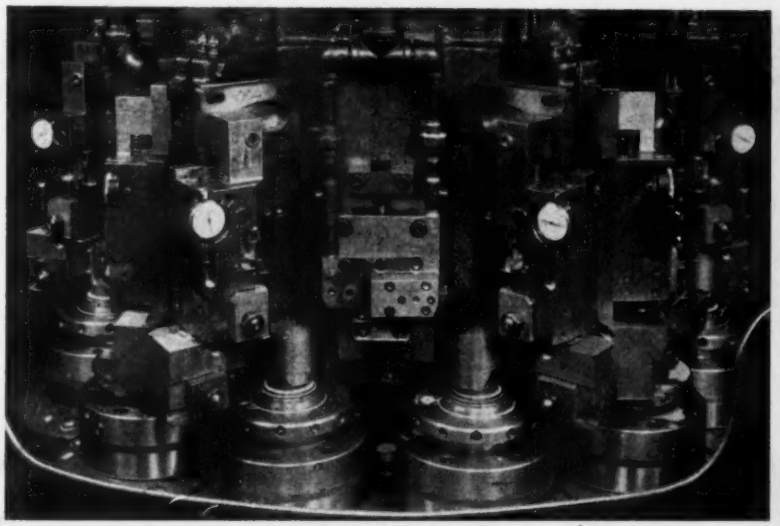
No other Special-Purpose Machine produces so much for so little

If you are interested in a time-tested method for getting maximum production at lowest unit costs without sacrificing accuracy, you will want to investigate the Bullard Contin-U-Matic Lathe.

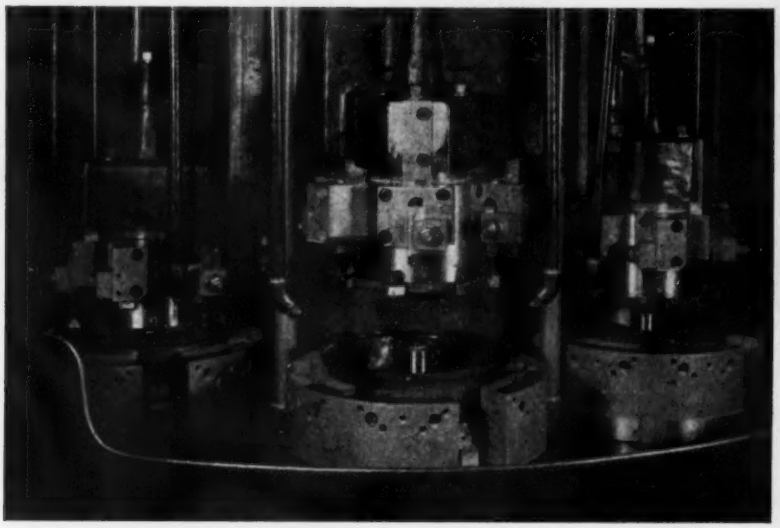
Based on the well-known Bullard vertical construction whereby work continuously rotates about the central column, this machine delivers a finished piece each time one of the six or twelve spindles reaches the loading station.

Because the Contin-U-Matic is tool-engineered for maximum production and loses no time in indexing, it gives you the ultimate in low-cost mass production.

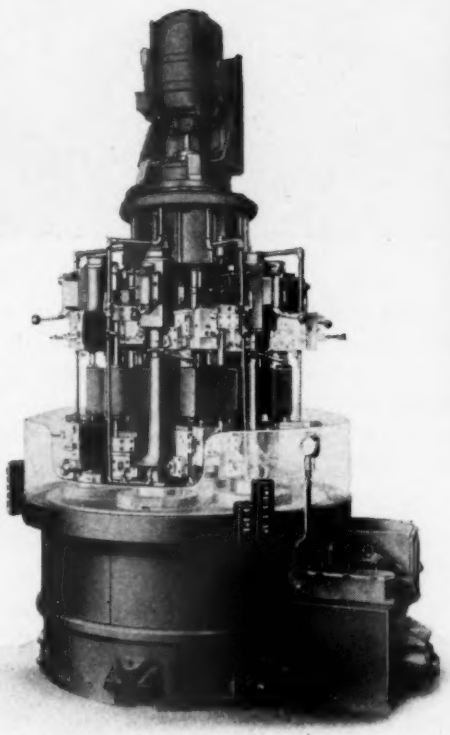
The Bullard Contin-U-Matic Lathe is made in 14" and 20" sizes with six spindles and in the 10" size with either six or twelve spindles. Write today for complete information. The Bullard Co., Bridgeport 2, Connecticut.



Close-up of job being produced on 6-spindle Contin-U-Matic



Close-up of job being produced on 12-spindle Contin-U-Matic



Typical Bullard Contin-U-Matic Lathe

BULLARD

CREATES *NEW METHODS* FOR MAKING MACHINES DO MORE

WHICH "Surplus" IS RIGHT

★ Just as the same sized hat will not fit every man, the same model Warner & Swasey Turret Lathe and set of tools is not best adapted to every job. Over a period of years, our engineers have designed and perfected a whole series of models and tooling set-ups purposely to help you get the very utmost in production. And in a new machine sale, our field engineers make certain that every customer gets the one that's right for his job!

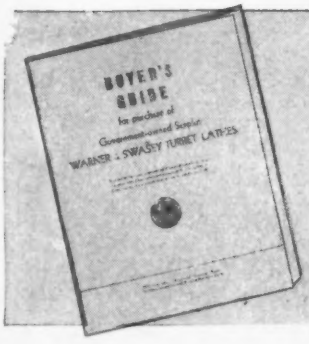
Today, however, many government-owned surplus Warner & Swasey Turret Lathes are available. If you are planning to invest in a surplus Warner & Swasey—which you must buy "as is", contact our nearest Branch Office. After obtaining the model and serial number, all you need to do is give us this information. We will send you the date of shipment of the turret lathe—the way it was equipped when it left the factory, and the types and sizes of work for which we believe it is best fitted.

Write to us here in Cleveland, or see our nearest Branch Office. We'll be glad to help you get the most out of any Warner & Swasey you buy!

You can Machine it Better, Faster, for Less... with a Warner & Swasey

WARNER & SWASEY

FOR YOUR JOB?



SEND FOR FREE COPY

The "Buyers Guide" will prove a valuable aid in helping you determine the proper Warner & Swasey Turret Lathe to suit your needs in the purchase of surplus turret lathes. To get a copy, just write to us here in Cleveland or contact your nearest Warner & Swasey Branch Office.

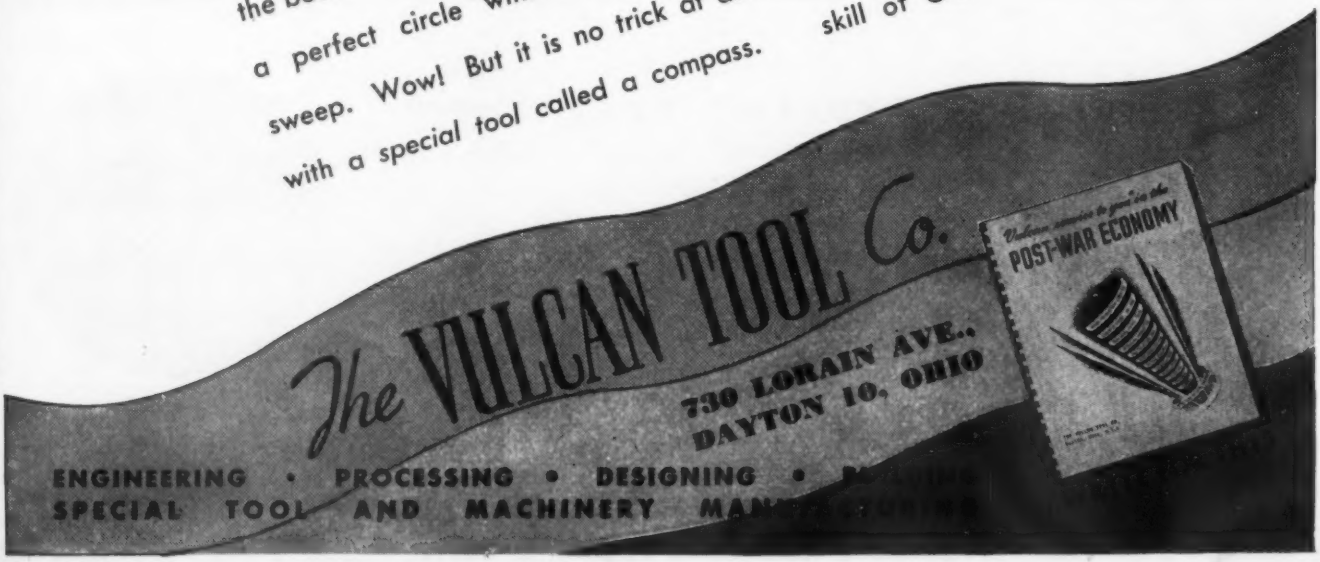
WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—PRECISION TAPPING AND THREADING MACHINES

Near the grotto of Giotto they tell this story

They say that when critics had the nerve to carp about his work the great thirteenth century Italian artist Giotto put the bounders in their places by drawing a perfect circle with one freehand sweep. Wow! But it is no trick at all with a special tool called a compass.

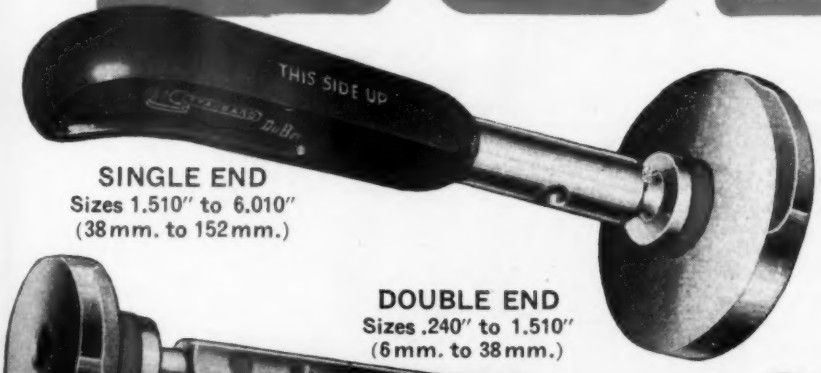
If in your plant there are many operations for which no special tool has been provided to increase speed and guarantee perfection, don't despair! Vulcan can design and build special tools that will endow Otto with the skill of Giotto.



NO PILOT NECESSARY

Now! CHECK BORES FASTER more accurately

DuBo



SINGLE END
Sizes 1.510" to 6.010"
(38mm. to 152mm.)

DOUBLE END
Sizes .240" to 1.510"
(6mm. to 38mm.)

PATENTS PENDING

... that New, Better PLUG GAGE by STANDARD

HERE is a radical improvement over old-style, limit plug gages. DuBo is designed for greater ease - in - use, finer precision, more thorough inspection, faster gaging. Its unmatched lightness and balance give finger-tip control and amazing sensitivity in revealing internal bore conditions ordinarily passed over by common cylindrical plug gages.

Write for Special Bulletin.

DuBo Tells More...More Easily

Spherical gaging surface, chamfered, relieved and self piloting, enables DuBo to be inserted easily into bores of extremely close tolerance.

Out-of-roundness, taper, belling and dimensional deviations revealed by unmistakable tilt of handle.

May be used in deep bores and close to the bottom of blind bores.

Finger-tip "feel" and control reveal internal conditions at any point in the bore. Light weight minimizes fatigue.

Plastic color signals, Green for Go, Red for Not Go, make identification easy, prevent errors in reading.

Chamfered edges automatically wipe bore and help prepare a clean surface for accurate gaging.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

PRECISE ENGINEERING FOR PRECISION PRODUCTION

The

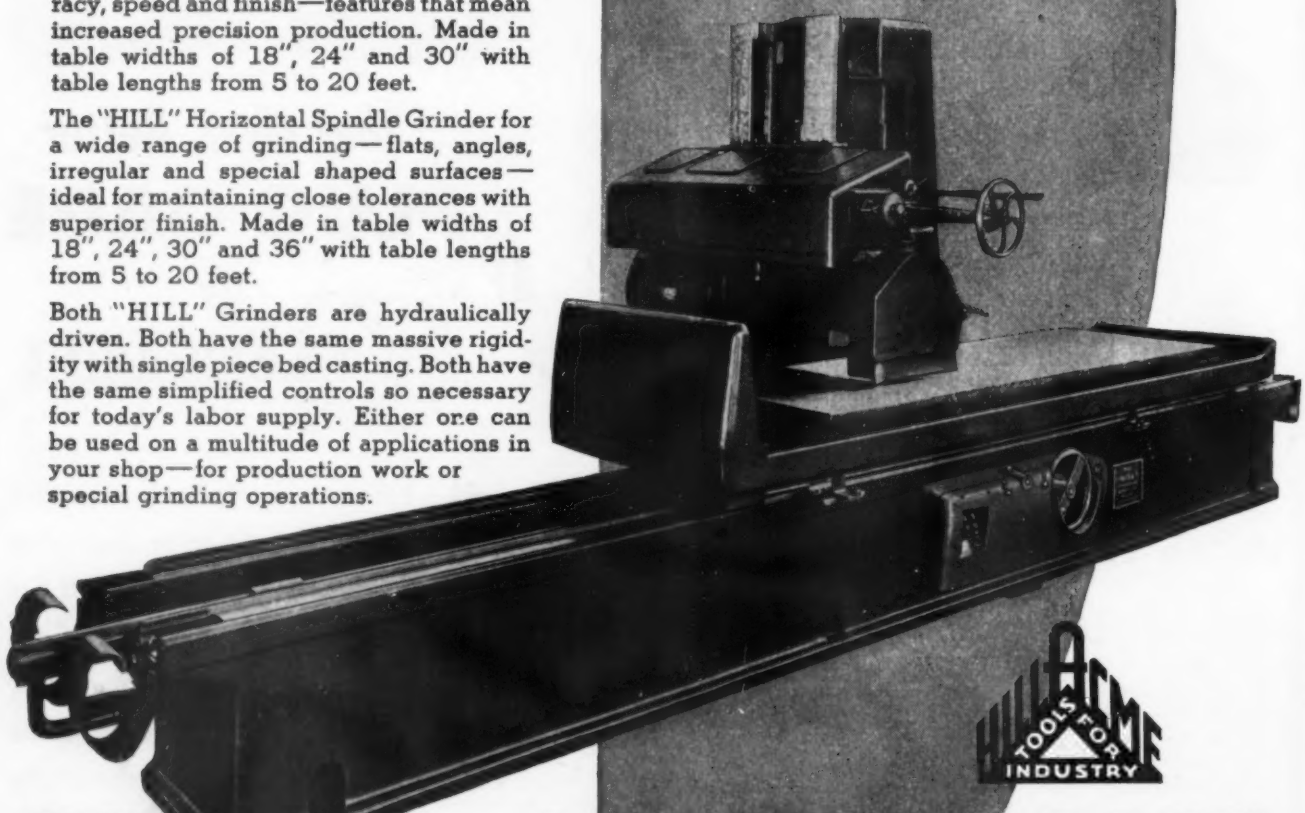
HILL "TWINS"

ONE OR THE OTHER WILL SOLVE EVERY HEAVY DUTY SURFACE GRINDING PROBLEM

The "HILL" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces—recommended for accuracy, speed and finish—features that mean increased precision production. Made in table widths of 18", 24" and 30" with table lengths from 5 to 20 feet.

The "HILL" Horizontal Spindle Grinder for a wide range of grinding—flats, angles, irregular and special shaped surfaces—ideal for maintaining close tolerances with superior finish. Made in table widths of 18", 24", 30" and 36" with table lengths from 5 to 20 feet.

Both "HILL" Grinders are hydraulically driven. Both have the same massive rigidity with single piece bed casting. Both have the same simplified controls so necessary for today's labor supply. Either one can be used on a multitude of applications in your shop—for production work or special grinding operations.



HILL ACME TOOLS FOR INDUSTRY

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

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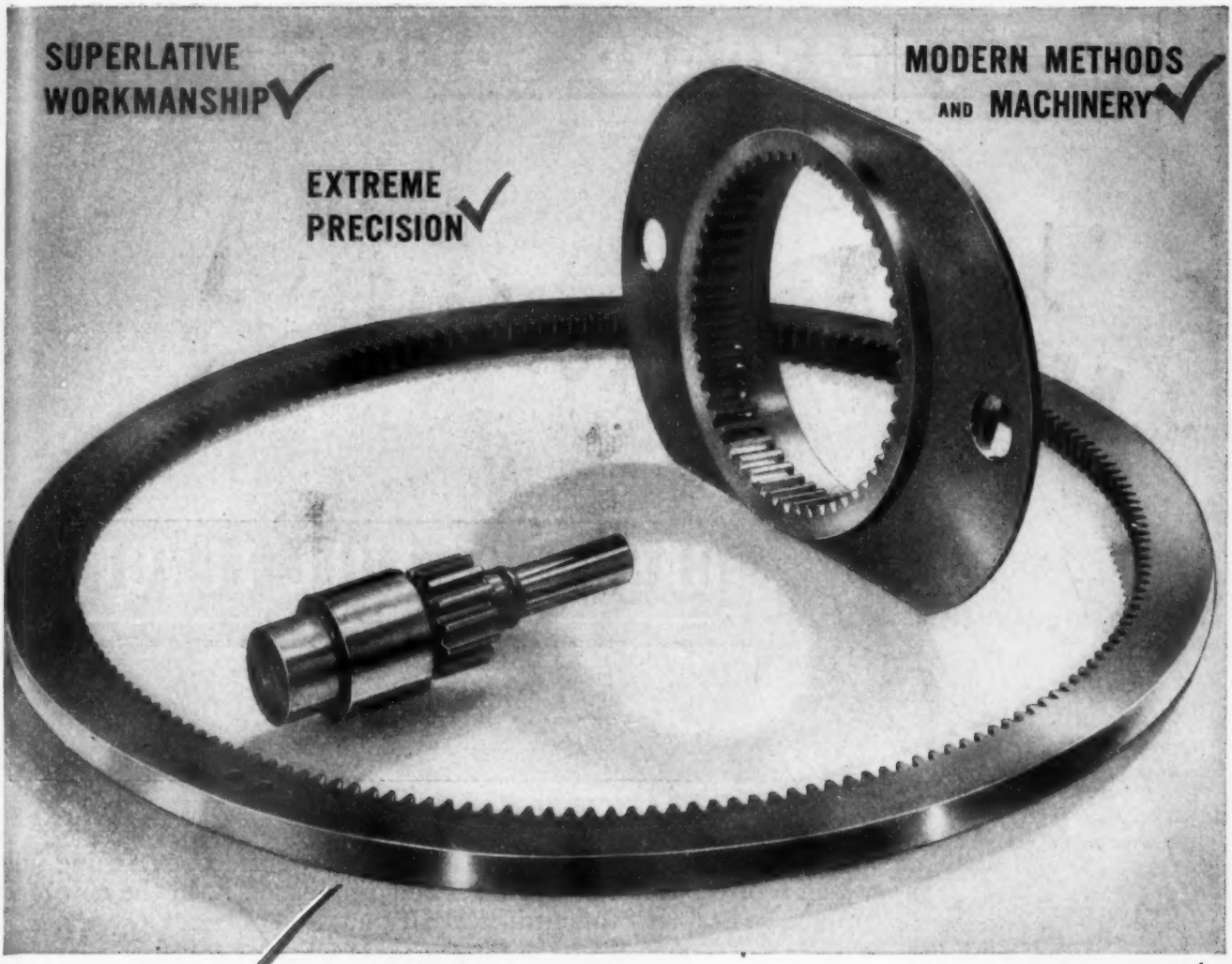

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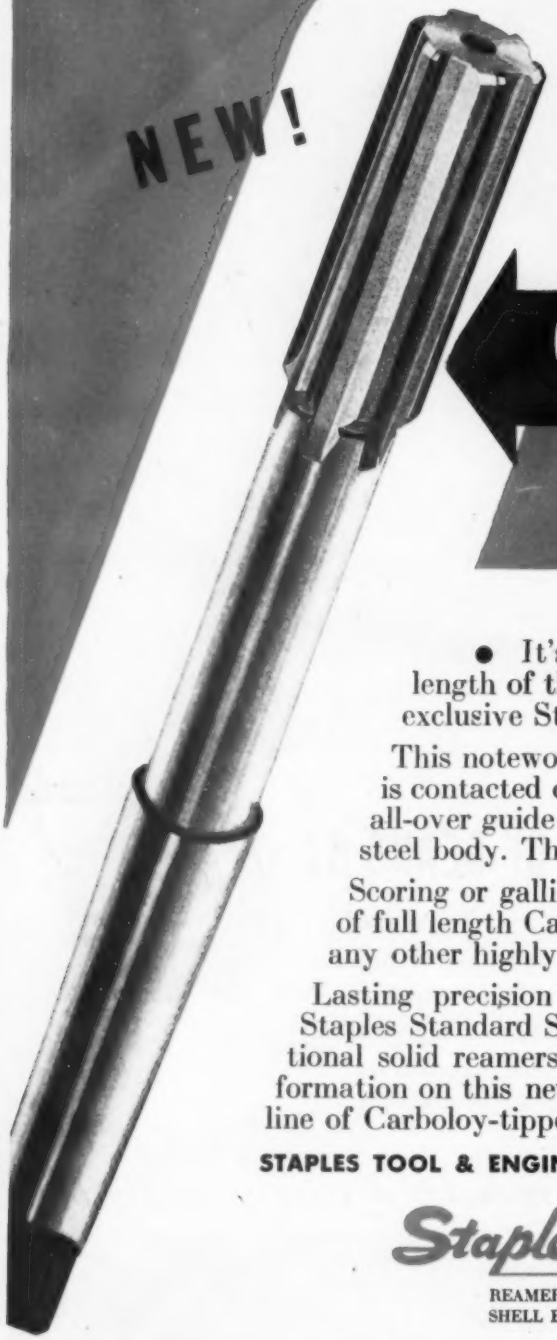

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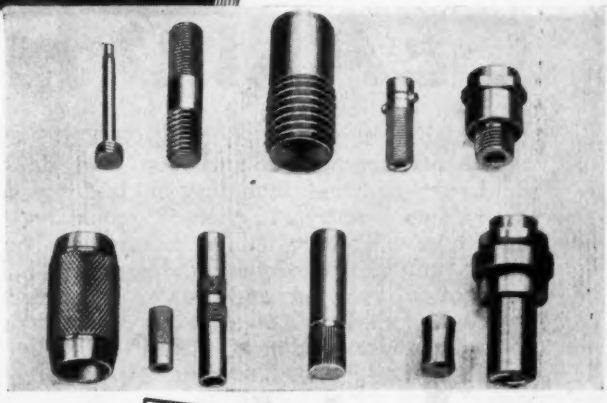

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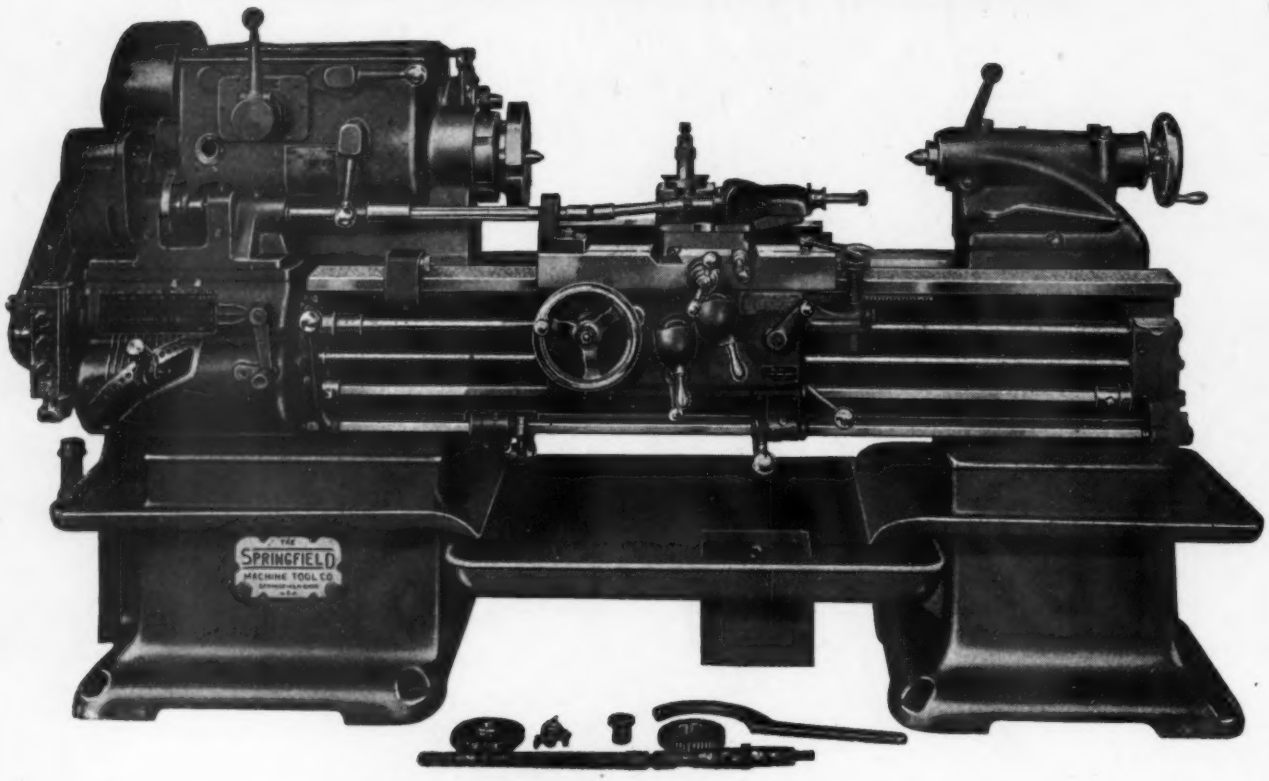

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Management Cannot Be Shared

THE management function of industry rests with management alone. By its nature it cannot be shared with anyone else. If it is shared, it means divided authority; and divided authority results in rapid disintegration of shop discipline, high cost of production and general inefficiency.

These statements appear elementary. Everyone knows them so well that merely to recite them seems unnecessary. They are publicly accepted by all groups—government, management and labor.

No labor leader has stepped forth to challenge them. If asked whether they want their men to share in actual management, union officers repeatedly affirm that the union's job is solely to bargain collectively with management about wages, hours and working conditions.

When Washington agencies suggested to union officials at Detroit that perhaps they would like to take over and operate Willow Run, the latter shrank from the responsibility and hastily answered that their task was solely to act as the workers' agents in collective bargaining.

Yet we hear recurring stories of union actions that sound powerfully like definite encroachments upon the recognized prerogatives of management.

It is not uncommon for a company to prove that a top limit has been put by union decree upon the amount of work men may produce in its factory. Is that not usurpation of management's disciplinary control?

Employee suggestion systems in certain plants have been handicapped because shop stewards discouraged men from making suggestions, particularly those pertaining to labor-saving devices. Is that not a sample of the union's taking unto itself the right to predetermine what policy the management should follow in matters that are exclusively management's?

One could cite many other examples that show the tendency of unions to inch over into management's field. Suffice it to say that in some centers, including Detroit, one of the burning questions is the right of management to run its plants without interference.

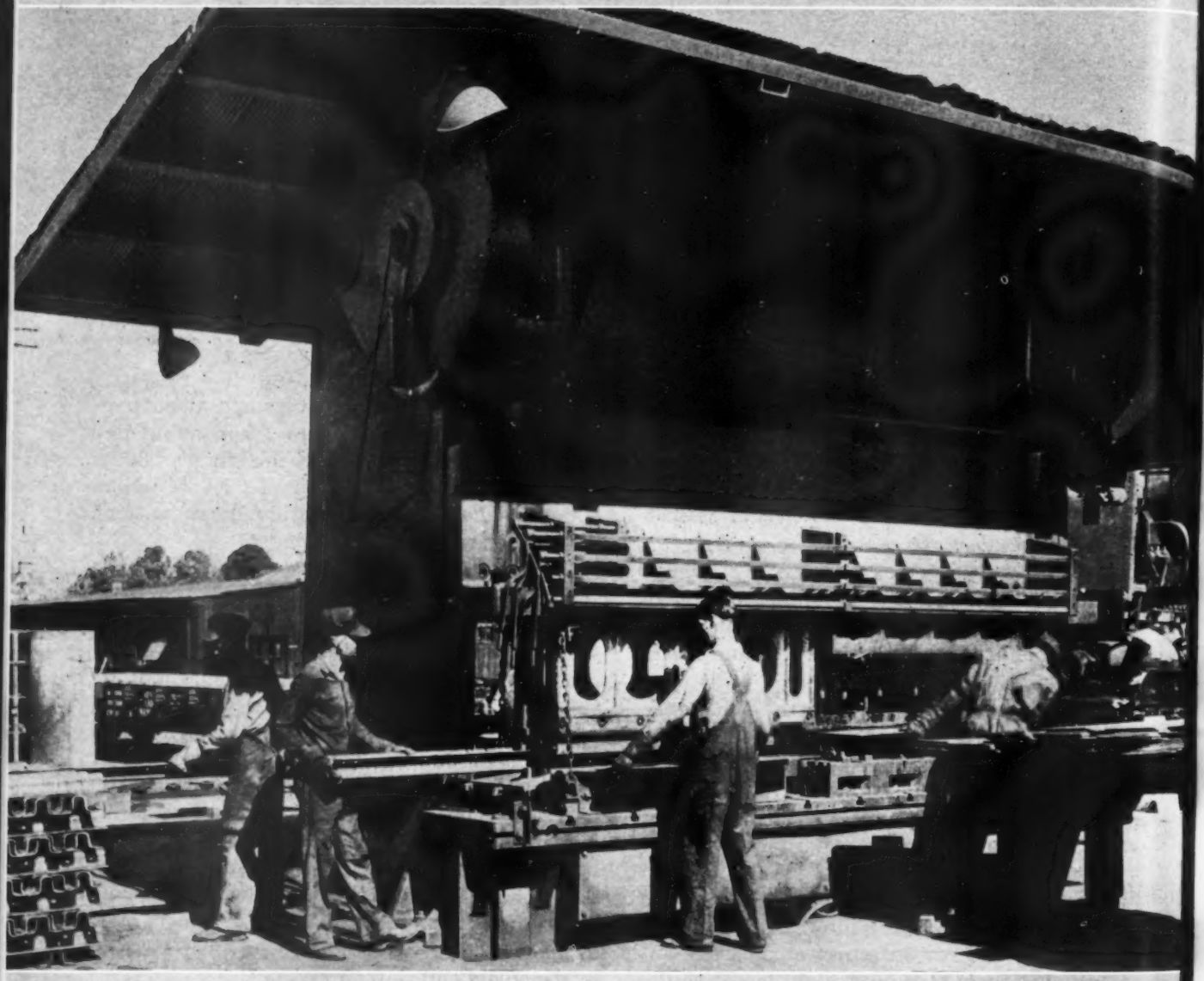
For the sake of fairness let's concede that there may be a twilight zone pertaining to working conditions in which decisions should be made cooperatively by employees and the management. Moreover, it is no secret that a belligerent management intolerant of advice and inconsiderate of employees' wishes can boil up its own cauldron of troubles within its own exclusive sphere of operation. Fortunately such managements are few in number.

The fact remains, however, that union leaders will serve their own purposes best if they refrain from trespassing upon management's functions. Management can only perform its assigned tasks successfully when it has a free rein. Without successful management, the jobs of all employees are imperiled and rendered insecure.

Self-interest alone should impel local and national labor officials to leave management's functions to management.

Burnham Finney

A DAILY DOUBLE...



Punching and forming car side stakes at one stroke is a daily double on this machine—a stake is completed on each hit.

At the right-hand station this Cincinnati Press Brake is punching forty-five $\frac{11}{16}$" holes in these $\frac{3}{8}$" blanks. The stakes are also formed and completed at the left, on the same stroke.

Write for Catalog B-2.

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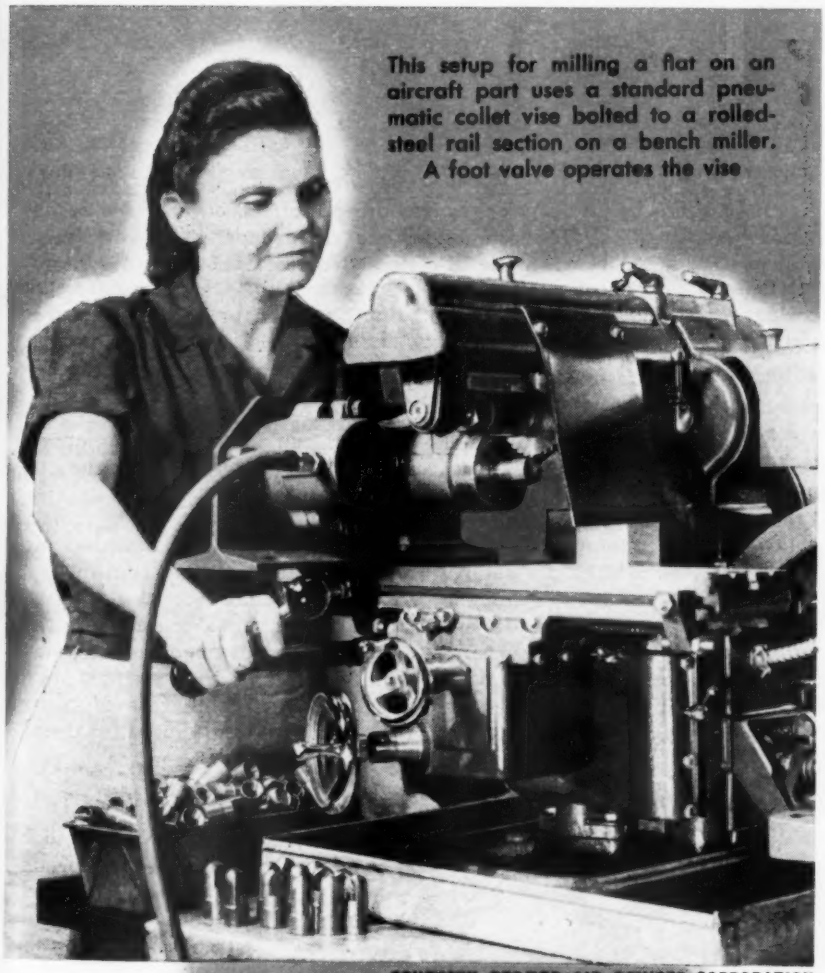
SHAPERS · SHEARS · BRAKES

Air Power

A USEFUL METALWORKING TOOL

BY BEN C. BROSHEER, ASSOCIATE EDITOR



This setup for milling a flat on an aircraft part uses a standard pneumatic collet vise bolted to a rolled-steel rail section on a bench miller. A foot valve operates the vise

COURTESY BEDNER AIR DEVICES CORPORATION

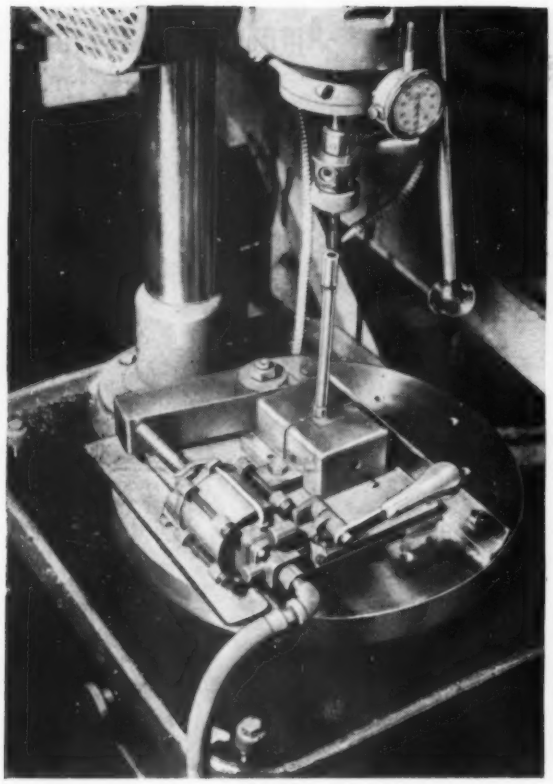
PNEUMATIC OPERATION of jigs, fixtures, chucks and other workholding devices proved worthwhile as a factor in speeding production on many items during the war. It contributed to safer and less fatiguing operations from a worker's standpoint. Air power likewise permitted the conversion of standard machines into automatic and semi-automatic units.

Conversion of facilities in metalworking plants from war production operations to the manufacture of civilian goods affords the tool and methods engineer opportunities to effect similar improvements through use of controlled air power. It represents a tool for keeping postwar production costs at a reasonable level.

A study of machine tools in several production departments of a large electrical manufacturer showed cutting time ranged between 15 and 30%. The remaining 70 to 85% represented setup time, loading and unloading time, tool maintenance and changing feeds and speeds. Improved loading and unloading methods were considered factors in increasing the productive efficiency of the machine tools in that study, and apply in many similar situations today.

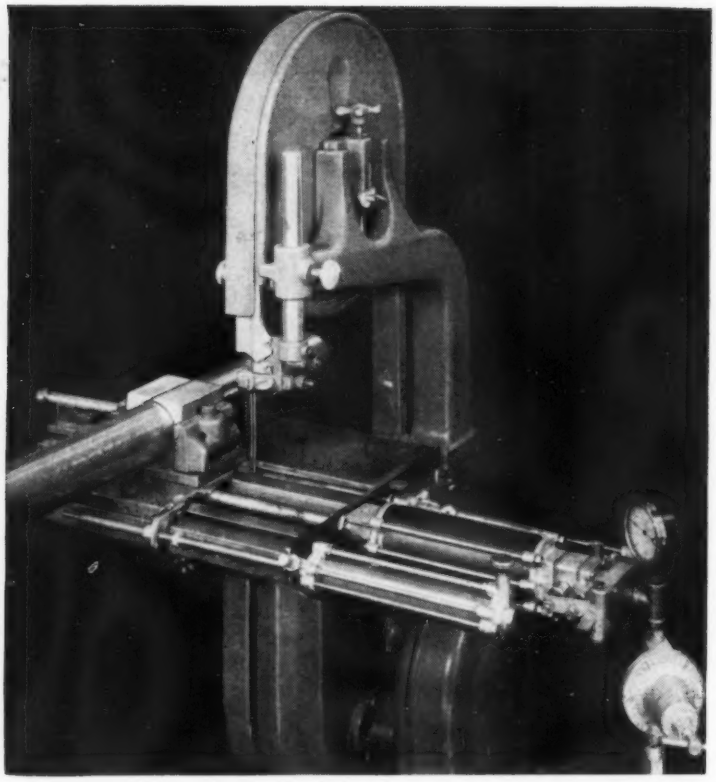
Motion analysis serves to eliminate all unnecessary movements, and

Controlled pneumatic operation of workholding fixtures proved advantageous in winning the wartime production race. Many of the novel application of air cylinders undoubtedly will find expanded use as industry completes its reconversion programs



COURTESY THE BELLOWS COMPANY

Lever-type fixtures easily can be arranged for air. This tool, used for tapping a hard part, is powered with a Senacon double-acting air cylinder with integral control valve. In other setups, the valve lever, linked to the machine quill, provides automatic clamping on the down stroke and release when the spindle returns



COURTESY THE BELLOWS COMPANY

Metal bandsawing operations are performed efficiently with this machine. A Senacon long-stroke air cylinder feeds the work against the saw blade at a steady rate determined by the dashpot action of the "Hydro-Check" retarding cylinder mounted beside the air cylinder. Rapid approach can be provided by the point in the feed stroke at which the retarding cylinder starts to operate

to shorten and simplify all necessary movements required of production workers. Machining operations, loading and unloading of work from jigs, fixtures, vises and other workholding devices take up most of the worker's time. Air operation of these devices often reduces working time substantially.

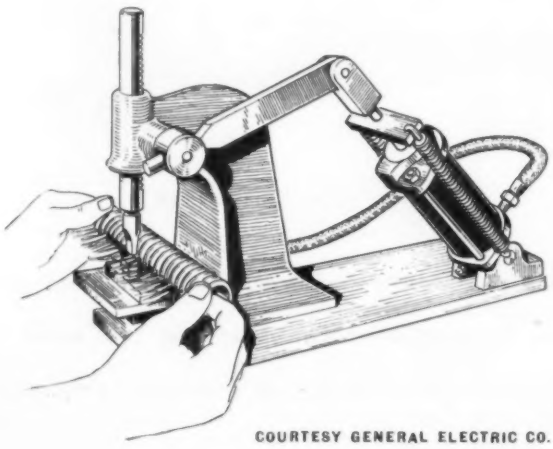
When pneumatic cylinders are applied to tools and machines, foot control valves, automatic ejection of the pieces by air-operated devices, control of multiple functions by a single air valve, and relocation of elements that retard operator movement work well.

Installation of a standard pneumatic vise, with or without special workholding jaws, on a standard machine tool often speeds production. This inexpensive attachment can be applied readily to another operation later.

When standard or special pneumatic cylinders are required for specific jobs, they can be used on other work and thus reduce tooling costs. Several companies using air cylinders for tool applications during the war found it best to standardize on a series of cylinders covering a wide range of clamping pressures and piston travel. Fixtures were designed to use the standard cylinders.

When it is necessary to retard the stroke of a piston, cushioned cylinders are recommended. If the cushioning action is required for the complete stroke or a large portion of it, a speed control valve or use of a second air or hydraulic cylinder, smaller in size to oppose action of the pressure cylinder, offers a solution.

In some applications of pneumatic cylinders for moving machine elements, as in providing power feed to a drill spindle or the table of a milling machine, the feed rate is controlled by an opposing hydraulic cylinder having an outlet port small enough to limit the rate of piston travel to a predetermined maximum



COURTESY GENERAL ELECTRIC CO.

Conversion of a light arbor press for swedging, forming and riveting operations easily is accomplished by the use of a spring-return air cylinder. In the setup shown, vertical ram travel is ½ in. and a maximum of ¾-ton pressure is exerted at the work point. After tripping, the ram remains down until the foot valve is released

value. Rate of feed is changed by a valve which varies the rate at which oil is forced from the hydraulic dashpot cylinder.

Cushioned Cylinder Useful

All that is required for many operations is a standard "cushioned" air cylinder. There is a cushion projection on the side of the piston facing the head at the end of the stroke to be cushioned. The length of the cushioned portion of the piston stroke is determined by the length of the projecting *collar* (as it is called when applied to the piston-rod side of the piston) or *plunger*. When this projection enters the head of the cylinder, all major access to the exhaust port is reduced to the smaller auxiliary port in the cylinder head. A needle valve regulates air flow.

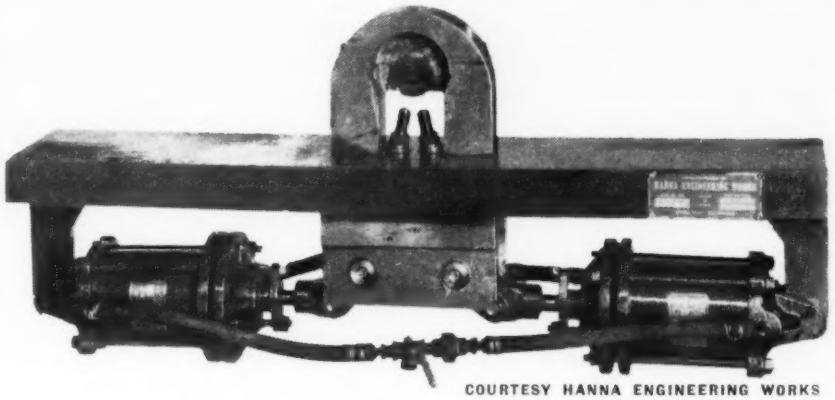
Regulation of the flow of air from the "trapped air" chamber between the piston and the cylinder head governs the speed of the cushioning action. Some cushioned cylinders have a ball check valve to permit faster action at the start of the return stroke. Compressed air holds the ball against its seat when the cushioning action is taking place. When the operating valve reverses to introduce air for the return stroke, the ball is blown away from its seat so additional air flows into that end of the cylinder.

The action of the cushioned portion of the stroke of an air cylinder depends on variables difficult to determine. Installation conditions sometimes prevent proper functioning of this construction—at times cylinders having considerable weight attached to the piston rod are difficult to cushion properly. Adjustment of the needle valve is important. If the needle is adjusted properly, the piston will hesitate, but not bounce, and then settle gently against the cylinder head. If perfectly adjusted, the piston simply comes to rest gently on the cylinder head without jerkiness or bounce. When the needle valve is closed too tightly, the piston will bounce on the air cushion, and if it is opened too wide, the piston will strike or recoil on the cylinder head.

Speed-control valves, often used to slow down the action of an air cylinder for the entire length of its stroke, meter the exhaust of air from the cylinder. These valves usually are a combination of a check valve and an adjustable speed valve to provide free flow in one direction and retarded flow in the other. This permits controlled speed on the power stroke and full speed on the return stroke. Two valves are used for speed control in both directions.

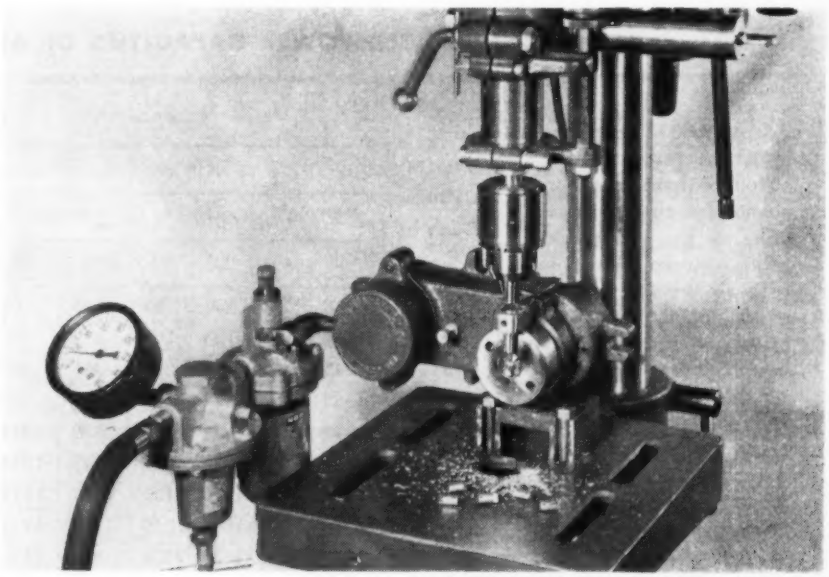
Pneumatic cylinders can be used for power movement in any direction, and are available in a wide range of sizes and mounting designs. Their control valves can be mounted to suit the convenience of the operator, or arranged for automatic actuation from a moving part of the machine. Standard four-way hand-control valves are used generally for controlling double-acting cylinders, by plugging one cylinder port. Spring-return hand-control valves reverse the cylinder instantly upon release of the valve lever. Pedal- and button-type foot control valves are used where the operator must use both hands in loading and unloading the jig or fixture. These valves generally are of the spring-return type. Solenoid operated three- and four-way valves often are recommended for operating pneumatic cylinders when automatic or remote control is required. They can be actuated by a variety of pressure switches, pushbutton switches, or automatic switches.

Where power actuation is needed in both directions, double-acting cylinders generally are preferred. In some instances, however, spring-return cylinders perform to better advantage. Their cost is greater than



COURTESY HANNA ENGINEERING WORKS

Clevis or trunnion mounting of air cylinders frequently simplifies tool design by making complicated linkages unnecessary. The two cylinders shown operate on 100 psi. line pressure for heading two rivets at a time in a small assembly



COURTESY REDMER AIR DEVICES CORPORATION

Frequently the addition of brackets to support guide bushings is all that is necessary to convert a standard air vise into a single-purpose drill jig. This arrangement of a collet-type vise is for cross-drilling a small hole in a pin. The use of a pressure regulator and an air-line lubricator is recommended for high operating efficiency

that of a double-acting cylinder of the same capacity.

When selecting a cylinder for a given application, it usually is best to specify a size capable of about 1½ times the force considered sufficient for the job. This is adequate to cover unknown factors present in most applications. Most available methods for calculating the force a cylinder must exert to do a job are only approximations and it is best to have reserve capacity. The possibility of high static load of the parts to be moved should be considered and, when necessary, additional power should be provided.

For rapid return movement, loads are usually less and a smaller piston area generally will suffice for a fast return stroke with the same airline pressure. Cushioning at either or both ends of the cylinder reduces shock loads and affords controlled deceleration of the parts being moved. Pressure-regulating valves are recommended for most applications, since they assure economical use of air power and provide for operation of the cylinder according to the needs of the job.

While lubrication is not essential with most modern air-cylinder designs, it is advisable to provide an automatic airline lubricator where excessive moisture may be present or where the equipment may stand idle for any length of time. They serve as a precaution against corrosion of valves and cylinder walls.

Clean air is important. Strainers placed in air lines supplying pneumatic tools remove dirt, sand, grit, pipe scale or chips which otherwise might be carried into the control valves or cylinders to cause rapid wear of parts or improper functioning of valves. Strainers are usually necessary for installations requiring cushioned cylinders.

With proper selection and maintenance of compressors, air-line piping, valves, couplings and cylinders, the cost of compressed air for operating tools is low.

The cost of compressed air in operating a double-acting pneumatic cylinder is equal to two times the volume of compressed air consumed per in. of piston travel times the length of stroke in inches times the number of strokes times the cost of compressed air per cu. ft. when the volume consumed is in terms of cu. ft. for each in. of piston travel as given in the accompanying table. Single-acting cylinders are computed without doubling the volume of compressed air consumed per inch of piston travel. The cost of operating a 3-in. diameter double-acting cylinder with 1-in. stroke for 500 strokes a day is only $0.0014 per day when air cost is computed at $0.35 per thousand cu. ft.

Material for this article was made possible through the cooperation of the following organizations: Anker-Holth Manufacturing Company, The Bellows Company, Wichita Division of Boeing Airplane Company, General Electric Company, Hanna Engineering Works, Hannifin Manufacturing Company, Logansport Machine, Incorporated, Mead Specialties Company, Redmer Air Devices Corporation, A. Schrader's Son Division of Scovill Manufacturing Company, Studebaker Machine Company, Tomkins-Johnson Company and Westinghouse Electric Corporation.

AIR CONSUMPTION OF CYLINDERS

Diameter Bore, in.	Cu. ft. of air consumed per in. of piston travel*	Strokes per 1,000 cubic feet of air (one-inch stroke)
1½	0.0012	833,333
2	0.0018	555,555
2½	0.0028	357,142
3	0.004	250,000
4	0.0072	138,888
4½	0.0092	108,695
5	0.0113	88,496
6	0.0163	61,349
7	0.0222	45,045
8	0.029	34,482
9	0.0368	27,172
10	0.0455	21,978
12	0.0654	15,290
14	0.089	11,236

**The amount of compressed air consumed in cubic feet is the same at all pressures.*

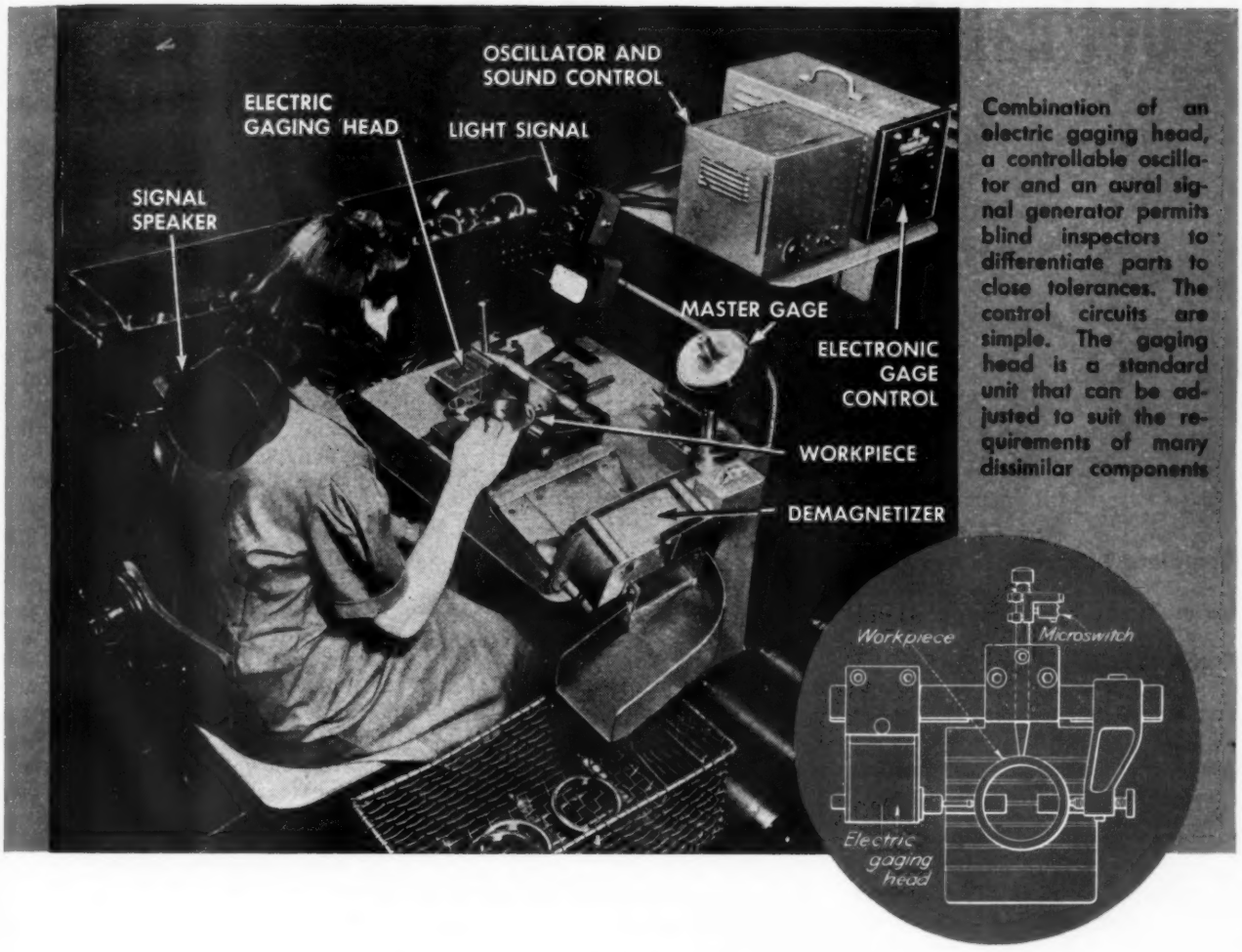
For double-acting cylinders, air consumed per stroke is twice the amount shown above for single-acting cylinders. (Tomkins-Johnson Co.)

CALCULATED POWER CAPACITIES OF AIR CYLINDERS

Cylinder capacities (pressure exerted by the piston rod) are given in pounds for air-line pressures in psi. of piston area. Stroke "out" is with air pressure exerted on the "blank" end of the piston, while stroke "in" is with air pressure exerted on the piston-rod end of the piston. Values are theoretical, without allowance for friction losses. Usually, about 5% of theoretical capacity must be allowed for such losses when leathers and glands are in good condition and adjusted properly.

(Tomkins-Johnson Company)

Dia. of Cylinder Bore, in.	PRESSURES											
	50		60		70		80		90		100	
	stroke		stroke		stroke		stroke		stroke		stroke	
	out	in	out	in	out	in	out	in	out	in	out	in
1½	88	78	106	94	123	109	141	125	159	141	176	157
2	157	134	188	161	219	188	251	215	282	242	314	269
2½	245	223	294	268	343	312	392	357	441	402	490	446
3	353	314	424	376	494	439	565	502	636	565	706	628
4	628	589	754	706	879	824	1000	942	1130	1060	1256	1178
4½	795	755	954	907	1113	1058	1272	1209	1431	1360	1590	1511
5	981	942	1178	1130	1374	1319	1570	1507	1767	1696	1963	1884
6	1413	1374	1696	1649	1979	1924	2262	2199	2544	2473	2827	2748
7	1924	1862	2309	2235	2693	2608	3078	2980	3463	3353	3848	3725
8	2513	2439	3015	2926	3518	3414	4021	3902	4523	4390	5026	4878
9	3180	3109	3827	3731	4453	4352	5089	4974	5725	5596	6361	6218
10	3927	3838	4712	4606	5497	5374	6283	6141	7068	6909	7854	7677
12	5655	5534	6786	6641	7917	7748	9048	8855	10179	9962	11310	11069
14	7697	7539	9236	9047	10775	10558	12315	12063	13854	13571	15394	15079



Combination of an electric gaging head, a controllable oscillator and an aural signal generator permits blind inspectors to differentiate parts to close tolerances. The control circuits are simple. The gaging head is a standard unit that can be adjusted to suit the requirements of many dissimilar components

Blind Inspectors Gage by Sound

BLIND PERSONS equipped with electronic gaging devices are performing efficient inspection work on parts having tolerances as fine as 0.000025 in. at the Canton, O., plant of the Timken Roller Bearing Company. Their inspection work covers rolls, cones, cups and other bearing components.

An aural signal of three note-frequencies produced by an electronic oscillator indicates to the blind inspector whether the part is above, within or below the tolerance limits. The notes are induced by relays introduced into the oscillator circuit by an electrically sensitive, mechanically actuated gaging head. An intermediate tone indicates the part is acceptable, while a high note shows it is above, and a low note indicates it is below the acceptable tolerances.

A single master gage is used to adjust the gaging head and determine the setting for instruments in the electronic gage control cabinet. The gage is a metal plate finished to an intermediate between the upper and lower limit. With the master gage inserted in the gaging head, the sizing control meter is adjusted to zero and the intermediate tone control aligned to signal an acceptable part. The sizing control meter is then set to the upper and lower limits of tolerance so the intermediate signal will be oscillated whenever the gaging head is adjusted by the insertion of a part within these limits. If an inserted part adjusts the gaging head beyond the limits set by the sizing control meter, the gaging relays will cause the high tone or the low tone to oscillate, depending upon the direction of part error.

To insure against error in setting the tonal variation or deviation of the electronic oscillator from original settings, a visual indicator is provided for use by a sighted supervisor. A three-light panel—utilizing red for oversize, green for an undersize condition, and orange for an acceptable part—is connected with the electronic gage control circuit. Without disturbing the operator, supervisors can check the device while the inspection flow continues under control of the operator.

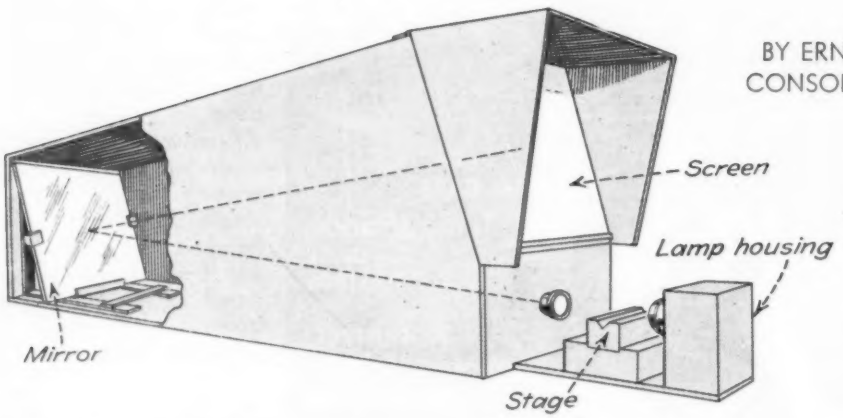
A microswitch in the speaker circuit deenergizes the cone speaker to eliminate the continuous low note generated by the oscillator when no part is in the gaging head.

Auxiliary to the gaging system is a demagnetizer which neutralizes any magnetic flux induced by proximity of the inspected parts to the power and control units of the instrument.

The Timken Company is operating more than 50 units of this type and reports that blind operators regularly equal, and in most instances surpass, the best efforts of sighted inspectors in accuracy and speed of inspection.

Optical Comparator Made in the Shop

BY ERNEST J. HEYMAN, TOOL ENGINEER
CONSOLIDATED CAR-HEATING COMPANY



Complete instructions are given for making a bench-mounted unit that costs little and takes the guesswork out of checking small items for several dimensions

THERE ARE many plants that cannot afford the advantages of "shadow" inspection to check the lead and form of threads, shear angles of punches and contours of screw-machine parts as well as routine inspection. But with salvaged lenses and some ingenuity, a home-made optical comparator can be made that will save much time and trouble, even though the device does not possess the refinements and range of commercial equipment.

Since an optical comparator is a projector, the fundamental parts are: a light source, condensing lenses for lightbeam concentration, projecting lenses to magnify the shadow of the part, a mirror to reflect the enlarged shadow upon a screen and a stage upon which the object is mounted. Lenses constitute one of the largest cost items in any projector. Fortunately, the condensing and projection lenses can be purchased from salvage companies that specialize in chipped-edge or government-reject lenses. These lenses are satisfactory for comparator use and can be bought for a small fraction of their real value.

Other purchased items cost little. The light source is a 100-watt, 110-volt projection or spot lamp obtainable from a photographic supply house, or one can use a 50-cp. automobile headlamp bulb for which current is supplied by a 6- to 8-volt transformer. For the mirror, use a first-surface aluminized type; that is, one that is coated on the front of the glass and is flat and clear.

Construct the projector housing of sheet metal or wood. Main requirements of the housing are that it be light-tight and sturdy enough to prevent vibration of the screen and projection-lens holder. Paint the inside a dull black. The screen is a piece of ¼-in. plate glass measuring 20x29 in., and serves as a backing for pieces of tracing paper upon which shadows are projected and measured with an ordinary scale and protractor. Details are:

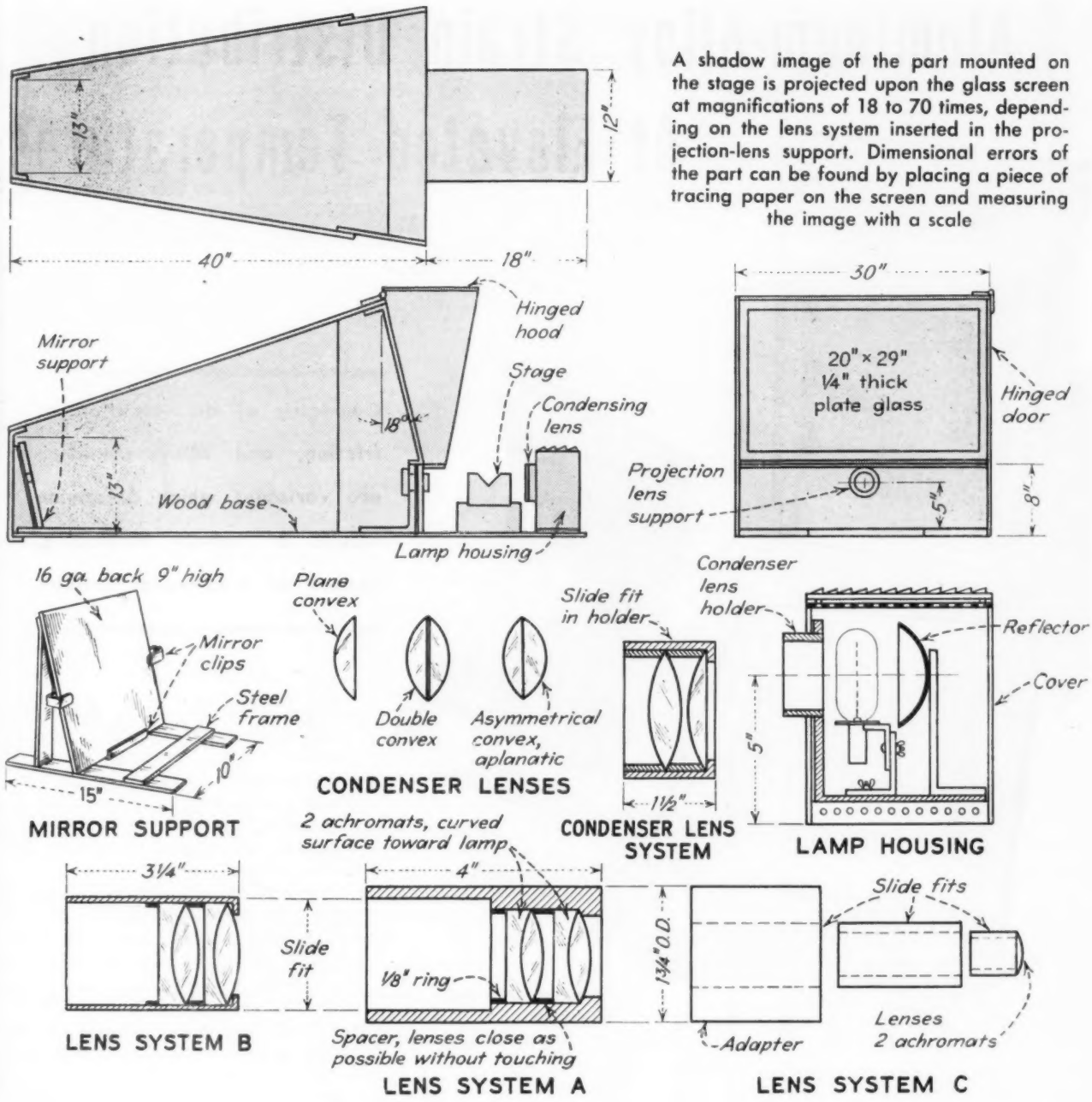
Light Source: The condenser-lens holder, the bayonet-type lamp socket and the reflector are held by brackets assembled together and resting on pads to assure better dissipation of heat. The lamp bracket is made in two pieces to permit up-and-down adjustment of the light source, and the foot is slotted for lengthwise adjustment. An adjustable reflector mounting is also desirable. Make a removable sheet-metal cover with louvers in the top and facing toward the rear. Drill holes in the wood baseplate, so air can enter the inclosure, absorb heat and escape through the louvers.

Mirror Mount: A backup plate with clips for the first-surface mirror should be fastened firmly to a sled support having runners engaging a track on the wood baseplate. The mounting angle is 9° to the vertical.

Condensing Lenses: Function of the condensing-lens system is to concentrate light rays emitted by the lamp so a sharp shadow of the workpiece on the stage will be projected upon the mirror and thence to the screen. Focal length of the system must be approximately equal to the distance between its centerline and the lamp filament, in this case about 2 in. This requirement is satisfied by using two plano-convex, two double convex or two aplantic lenses of 4-in. focal length each, because the focal length of the system is equal to half the focal length of a single lens. It is also possible to use one plano-convex lens with either one double-convex or one unsymmetrical-convex lens of equivalent focal length. Mount the lenses (of 2 to 3 in. diameter) so their greatest curvatures face each other, and space them with a metal ring so they almost touch. Inside diameter of the lens tube should be 0.002 in. larger than the lenses.

Stage: Efficient setups depend upon the stage. Make this so the platform is low enough to receive fixtures, V-blocks or centers and have both vertical and lateral adjustments.

Projection-Lens Systems: The magnification of the part shadow depends upon the focal length of the projection-lens system and the distance between that system and the mirror plus the distance between the mirror and the screen. With the light path fixed, the effect of focal length is as follows: a short focal length increases the size of the screen image but the intensity of illumination is reduced and the shadow is less sharply defined; increasing the focal length reduces the image size but increases definition. To cover the requirements of the comparator designed, three lens systems, *A*, *B* and *C*, were selected. Lens tube *A* is a good sliding fit in the holder and the back is bored to receive lens tube *B* with a sliding fit. Used alone, lens system *A* gives a magnification of up to 18 times; in combination with lens system *B*, it will give magnifications up to 30 times. Lens system *C* is a separate assembly and gives magnification up to 70 times. Center lines of all



A shadow image of the part mounted on the stage is projected upon the glass screen at magnifications of 18 to 70 times, depending on the lens system inserted in the projection-lens support. Dimensional errors of the part can be found by placing a piece of tracing paper on the screen and measuring the image with a scale

these lens systems must coincid with the centerline of the condensing-lens system.

Calibration of Comparator: Determine the exact location of the various sub-assemblies before fastening them permanently to the base. First, place the lamp housing so the filament is about 10½ in. from the screen support. Push the mirror sled all the way back. Light the lamp and with the condenser-lens tube ¼ in. outside its housing, adjust the lamp-socket bracket until the light beam is centered upon the hole into which the projection-lens holder will go. Adjust the condenser-lens tube in or out until a sharp image of the lamp filament is projected upon the screen. Center this image upon the screen by bending the mirror bracket forward or backward.

To locate the stage, proceed as follows: Put projection-lens tube *A* into the holder so it extends out about ½ in. A temporary block of correct height is placed between the projection lens and the lamp housing, to support a test object such as a ¼-in. screw. The block is moved back and forward until the screw-thread shadow is sharply defined on the screen. A point on the wood base directly under the screw is marked for the transverse centerline of the stage. The other lens systems are checked by keeping the screw on the centerline and focussing the lenses for sharp shadows. If focussing does not interfere with the test piece, stage and lamp housing have been located correctly.

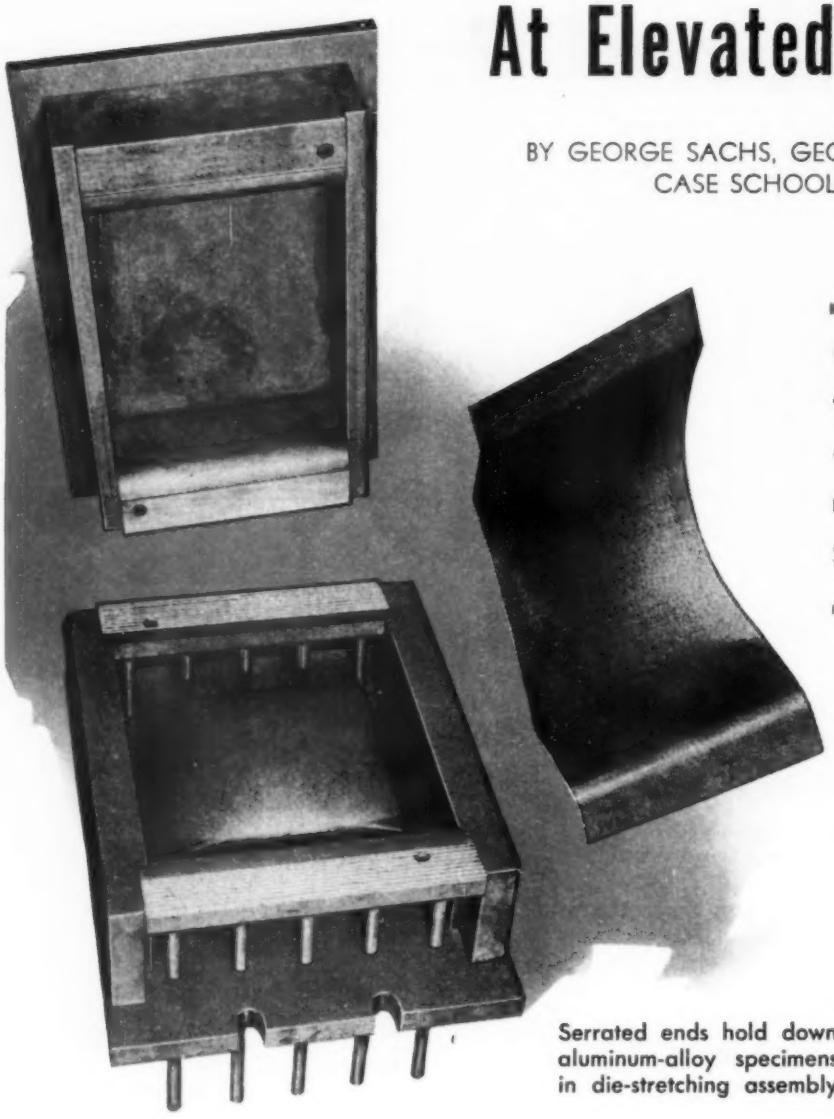
The mirror track is graduated for various magnifications as follows: Place a ball bearing or gage block of known dimension on the stage and adjust the mirror track until the desired magnification of image is secured. Then mark the track.

PROJECTION-LENS SYSTEMS

Lens System	Magnification, times	Focal Length, In.	Lens Dia., In.
A	18	6 to 7	1½
B	30 (with A)	5 to 6	1¼-1½
C	70	1¾ to 2	⅝-⅞

Aluminum-Alloy Strain Distribution At Elevated Temperatures

BY GEORGE SACHS, GEORGE ESPEY AND W. F. BROWN
CASE SCHOOL OF APPLIED SCIENCE



Serrated ends hold down aluminum-alloy specimens in die-stretching assembly

Geometry of die, location of friction, and alloy condition are variables which determine results of hot-die stretching. Second of a series of articles

ALUMINUM-ALLOY sheets, die-stretched under heat in plant tests, reveal a varying pattern of behavior and strain distribution. In these tests, involving tension primarily in one direction, annealed aluminum alloys showed higher forming limits at elevated temperatures, while aged alloys were either unaffected or even adversely affected.

Eighteen different conditions of 3S, 52S, 61S, 24S, R301, and 75S were tested in press equipment similar to that used for circular-bulging tests described in a previous issue. Specimen blanks were 15×8 in. and were reduced to 7 in. in the center to prevent fracture at the die radius. Heating cycles were the same as for circular bulging.

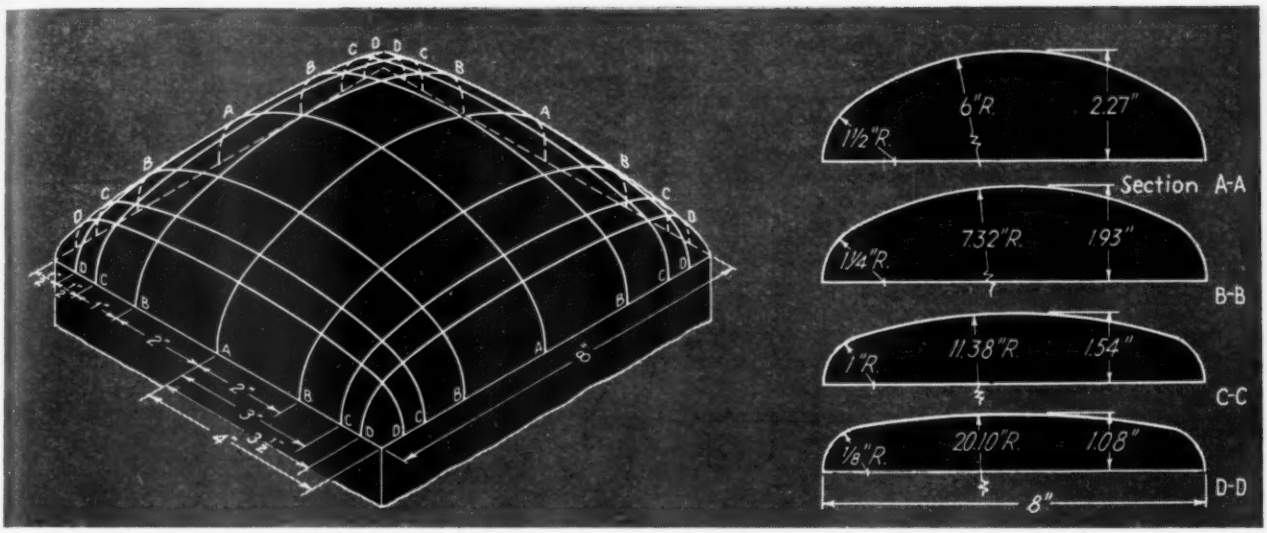
Forming limits were taken as the maximum longitudinal strain. Average longitudinal strains were derived from the distribution curves by considering an average of the measured strains over a gage length of 2½ in. either side of the pole. Normal strain measurements in the immediate vicinity of the fracture were made at appropriate intervals with a measuring microscope, in a direction perpendicular to the extension of the fracture.

In the standard tensile test the strain state is primarily one of uniaxial tension. At room and slightly higher temperatures, strain distribution along the longitudinal axis of a sufficiently long specimen indicates a region of practically constant strain between some point adjacent to the gripped ends and to the necked area, at which the strain rapidly increases to the value of fracture. This constant value of strain outside the neck is the "uniform strain" and is considered to represent the greatest stretch in uniaxial tension the metal may receive without necking.

Presumably, at elevated temperatures, the range of uniform strain is gradually reduced until, at sufficiently high temperatures, the strain continuously increases from the clamped area to the fracture. However, if the uniform strain be defined as the strain at maximum load, values of this strain at elevated temperatures may be determined from stress versus strain curves obtained in the tensile test. These values have been shown to decrease with temperature beyond a certain critical temperature.

Strain state and distribution in a part stretched over a large radiused double-curved die, while primarily one of uniaxial tension, is influenced by added factors of friction and geometry of the die. If friction were completely absent during die-stretching a part would fail at some point determined by the punch contour, at which the stresses and strains were highest. Because of the end effect, a wide uniformly strained specimen should show maximum strains in the center, almost as in circular bulging.

However, this condition may be



Contour characteristics of punch for testing 15x8-in. alloy specimens

influenced by the punch design and result in stress and strain conditions of widely varying uniformity. If the part is symmetrical the presence of friction will always shift the highest stress from the contour toward the ends. Thus, friction may result in a more or less uniform strain distribution across the contour, depending on the punch shape and magnitude of friction.

A strain distribution showing two maxima should be characteristic of high friction over the punch, while a single maximum at the pole indicates a smaller friction coefficient. Thus, the gradual shift of the maxima toward the pole with increasing temperature can be attributed to an improvement in the lubricating action of the soap.

In general, the strain distribution curves for stretching appear similar to the circular bulge, the longitudinal strain either continuously increasing from the punch radius to the pole or reaching two maximum values at or close to the punch radii.

All alloys except the artificially aged showed two maxima when formed at temperatures less than 300 F. With increases in temperature the maxima move toward the transverse axis of the sheet, until for alloys a single maximum appears near the pole at temperatures above 400 F.

Unbroken specimens showed evidence of local necking, particularly for the annealed alloys. Since the longitudinal strain measurements neglected the necked area, thickness measurements were made for a ductile alloy, 52SO, and a fairly brittle alloy, 24ST bare. Normal strain distribution curves indicated a rapid local rise in strain adjacent to the failure. For 52SO, at room temperature and 200 F., this range of local necking extended over ⅛ in. to each side while 24ST, bare, necked over only half of this range.

Curves of normal strain distribution show that strains outside the small necked area decrease slowly and uniformly. Thus, longitudinal strain computed from normal and transverse strains measured approximately 0.250 in. from the fracture agreed with maximum longitudinal strain taken from the longitudinal distribution curves. The range of local necking in these stretched specimens was much smaller than in a long tension test, but remained well defined even at the highest forming temperatures utilized in the tests.

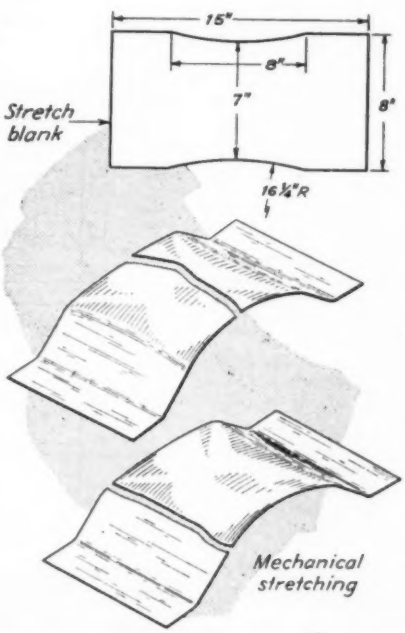
Stretched specimens fractured nearly perpendicular to the longitudinal axis in every case. A definite tendency to notch sensitivity was observed in stretching 24ST clad and 24SRT clad.

Forming limits for annealed alloys passed through a minimum between 200 and 300 F., the decrease in strain from room-temperature values being greatest for 24SO, bare and clad, and 75SO, clad. With further increase of temperature, forming limits for annealed alloys increased continuously from this minimum value. Hot-forming had no effect on forming limits of the aged aluminum alloy specimens investigated.

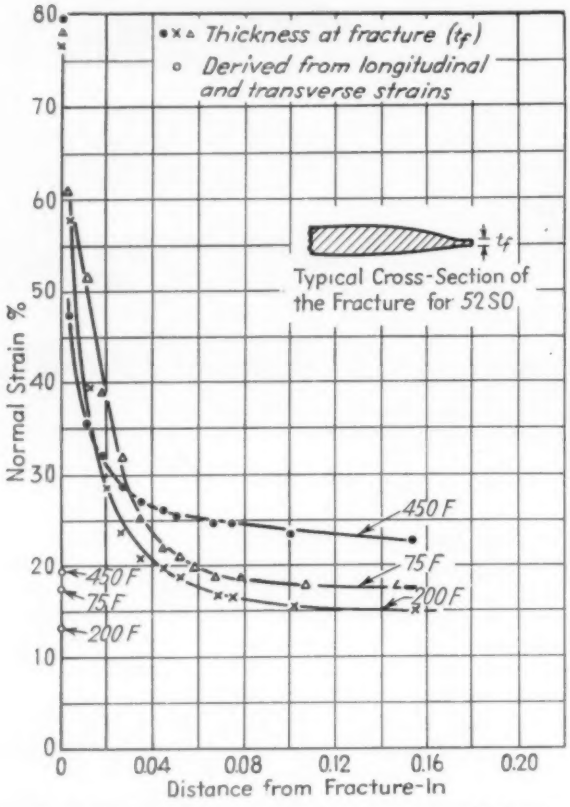
At room temperature the average longitudinal strains for annealed alloys were from 4 to 10% lower than forming limits at the same temperature, and were less affected by elevated temperature. For this particular set of experimental conditions the average longitudinal strain at all temperatures for all annealed alloys except 52SO was nearly equal to or greater than the uniform strain in uniaxial tension. Uniform strain was slightly higher than the average strain at all but the highest temperatures for 52SO.

Except for 3SO and 53SO the average longitudinal strain passes through a minimum at a temperature between 200 and 300 F. being nearly equal to the uniform strain in tension. With further increase in temperature the average strain for all annealed alloys increased continuously, but for only 75SO, clad, and 61SO, did the strains return to their room temperature values.

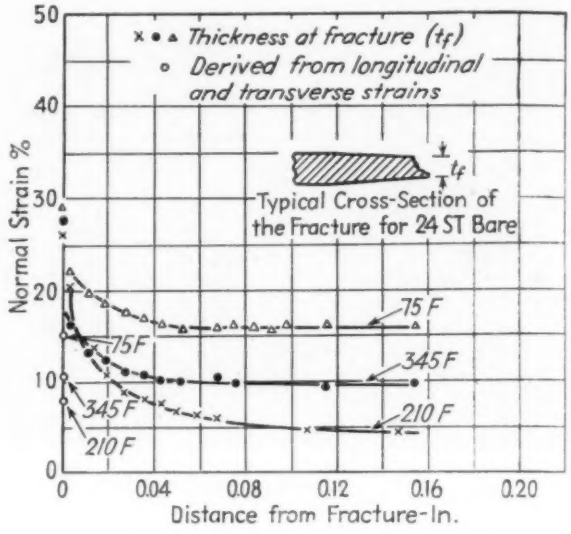
The number and interdependence of variables encountered in hot die



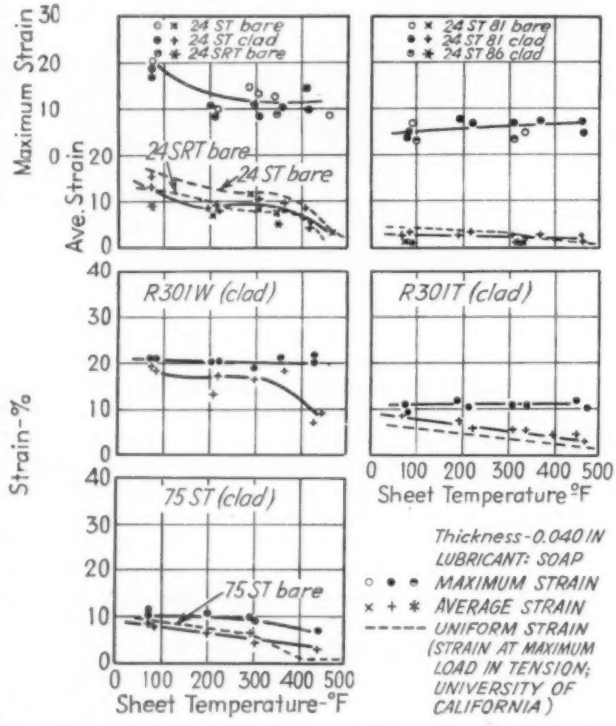
Typical fractures occurred at right angles to the longitudinal axis



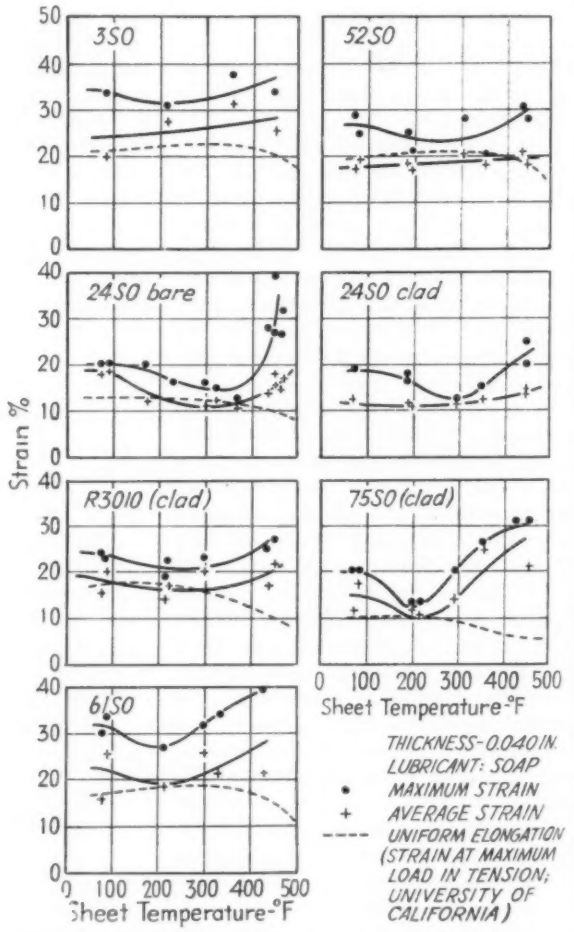
Normal strain distribution curves indicate a rapid local rise in strain adjacent to the fracture in ductile 52SO



Outside the necked area, strains, decrease slowly and uniformly for normal strain distribution of 24ST bare



Average strains of these aged alloys were adversely affected by high-temperature forming, except 24ST, which remained unchanged

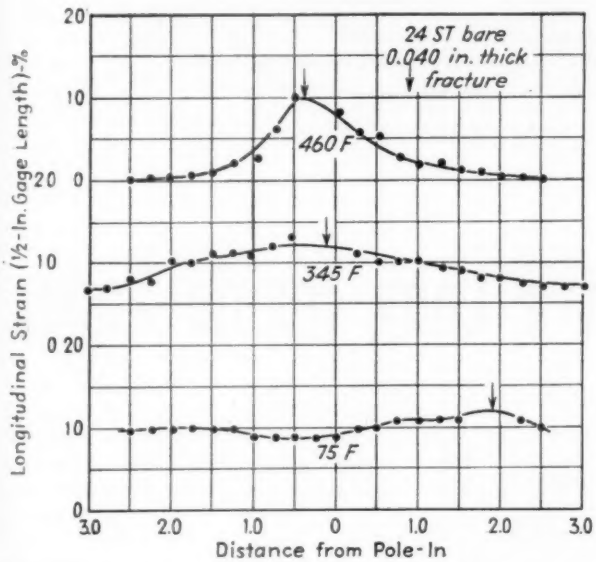


Average longitudinal strain is from 4 to 10% lower than forming limits at room temperature for annealed alloys and is less affected by rising temperature

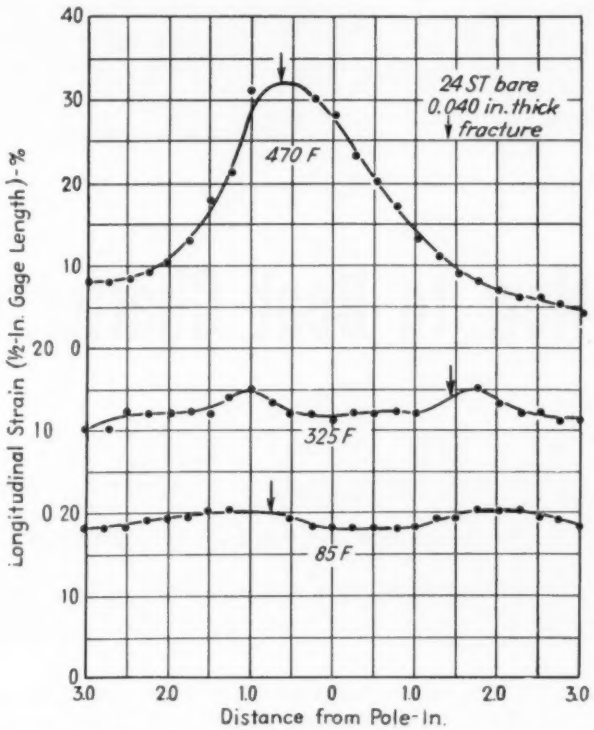
forming makes a quantitative evaluation of results impossible. However, if the effect of temperature on the measured strains be considered in conjunction with the distribution of these strains, some qualitative relations may be established.

It may be concluded that the minimum observed in the strain values of stretch-formed annealed alloys with increasing temperature is actually a property of the alloy. The effect of friction on annealed alloys was similar to that in the bulge test, that is the region of maximum strain was moved toward the punch periphery with increasing friction coefficient across the crown. However, on stretch-forming a shallow contoured part the change of stress state is from uniaxial tension to one close to plane strain. Since such change in stress state does not significantly affect the necking strain, a shift in location of the maximum strain affected its value to less extent than in bulging tests. Increasing temperature apparently had two distinct effects on stretched annealed alloys: (a) it reduced friction over the crown, allowing maximum strains to occur in this region and, (b) it caused the strains to increase rapidly near the crown.

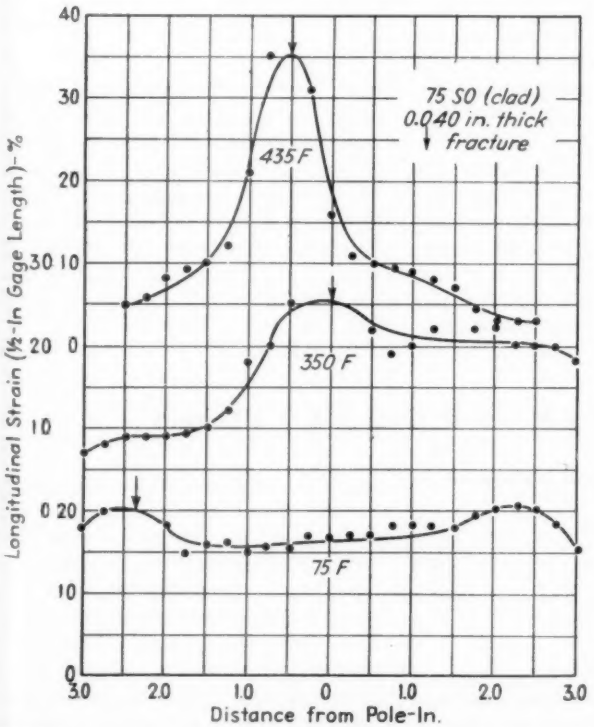
The concluding installment covering this research program will appear in an early issue. Cooperation of the Office of Production Research and Development and Glenn L. Martin Co., which provided facilities, made this program possible.



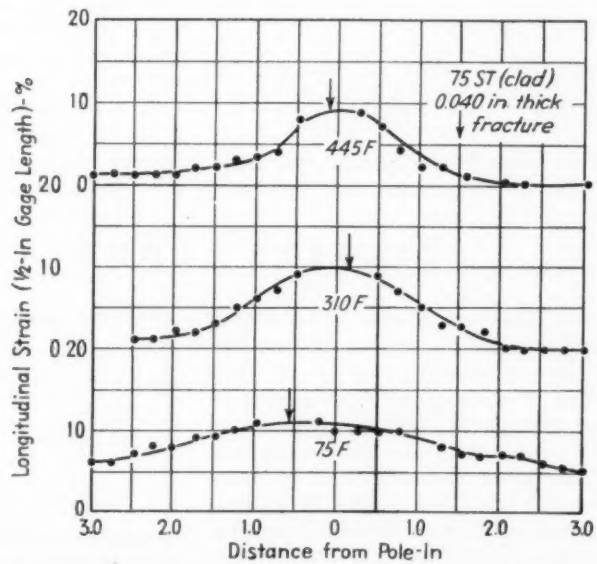
Longitudinal strain reaches a maximum near the pole above 400 F.



At lower temperatures 24SO shows two maxima in strain-distribution curve



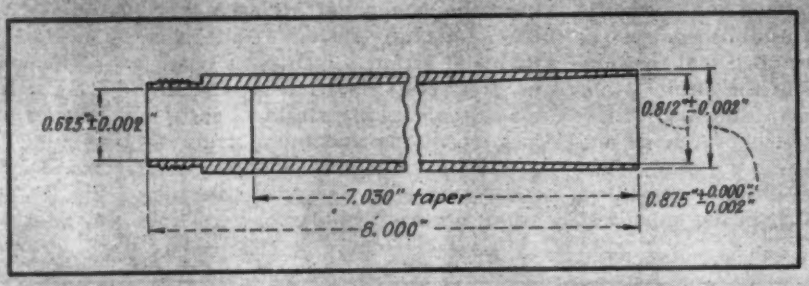
Widely varying strain distribution occurs in 75SO clad at all temperatures



Uniformity of strain pattern and a single maximum at the crown are shown for all temperatures of 75ST clad

This "tough" shop job brought a number of ingenious suggestions from readers. Ideas are summarized and sketched on the pages that follow

How Would You Machine This Long Taper?



A long unsupported bar boring a tapered hole caused excessive chatter at high cutting speeds; low speeds and fine feeds produced a better finish but required two hours for the cut

How to Beat Chatter on a Long Inside Taper

Readers suggest a taper reamer or added support for work and boring bar in machining this special piece. Rigidity gained by several ingenious solutions

DAVID T. ARMSTRONG'S article, "How Would You Machine This Long Taper?" closed with the question, "Does any reader have a better method?" A number of readers have contributed suggestions for handling Mr. Armstrong's job.

THE JOB—To machine a number of brass pieces with a 7.030-in. inside taper.

THE METHOD—All work was done on a lathe with a taper attachment. Brass bar stock, 0.937 in. dia., was centered and one end faced. The 8-in. dimension was laid out with a height gage and faced to line, indicating 8-in., and centered. Turn, neck and shoulder with piece between center and turn O.D. to 0.975 in. Drill to a depth of 4½ in., using ¼-, ½- and 9/16-in. drills in order.

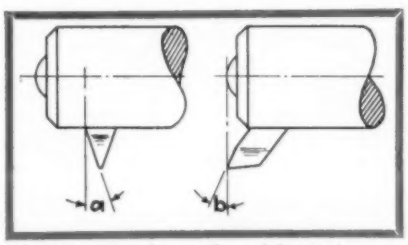
Reverse the piece and repeat drilling sequence until hole is through. Taper was set with a dial indicator and a boring bar turned between centers with the same taper as work, for rigidity. Piece was rough-bored at 100 s.f.p.m. with a feed of 0.005 in., leaving 0.010 in. for finishing. Finish boring at 10 s.f.p.m. with 0.0015-in. feed required two hours, but was the only procedure which produced an acceptable finish.

THE DIFFICULTY—Excessive chatter from the 8-in. overhang of the boring bar when cutting speed was raised. Because the tool is fed into the work at an angle, the cutting end of the boring bar could not be supported from the spindle and the diameter of the hole was too small to permit a self-adjusting boring tool.

READERS' LONG TAPER SUGGESTIONS

Avoid Forward Angle. Using a drag angle on the bit will cause less digging and chatter than a forward angle. The same principle applies to the position of the bar relative to the work. Here the forces resulting from the drag angle tend to draw the bar into the work. A neutral setting will meet average requirements.

For small bars, the tool-point radius should be but a few thousandths and honed, the correct height of the point being established by trial. Setting above center prevents digging and chatter from the downward spring of the tool. The boring tool should be tilted upward 4 to 6 deg. to present a radial cutting edge and avoid scraping action. A secondary clearance and a small land honed on the front cutting edge helps reduce vibration. Machining the boring bar to the same taper



Chatter may be reduced by using a drag angle *a* instead of forward angle *b*

as the hole provides added rigidity.

It might have been practical to take an old reamer and grind it cylindrically to the required taper, backing it off and deepening the flutes at the small end.

Another help in reducing the effects of vibration would be to bore first and finish the O.D. on a mandrel. This would also insure concentricity with the O.D.

Pull-boring overcomes some cases of chatter. If the hole is then bored slightly oversize the large end may be faced until the taper is correct. This is one of the easiest ways to size an internal taper. Rough-boring in two steps, front half of the hole first, will often give extra room and chip clearance for larger bars. *R. M. Dyke, Calgary, Alta., Canada*

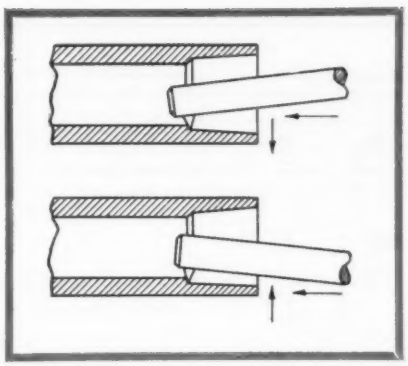
Hand Finish Taper. Would suggest chucking 15/16-in. stock in a lathe collet and step-drill, rough-taper bore, ream with the reamer held on tail center and finish the reaming by hand with the piece still in the collet. The O.D. could then be finished on a true taper arbor. The cost of making the reamer out of a taper or straight reamer, and that of the taper arbor, would certainly not be prohibitive. *F. E. Ervin, Painesville, Ohio.*

V-Block Fixture. Chuck 1-in. brass stock in a 1-in. collet, face one end, center drill, drill a 9/16-in. hole 4 in. deep and cut off 8.032 in. Drill lips should be of equal length and ground for brass. Drilling is carried out at high speed and with a liberal supply of coolant.

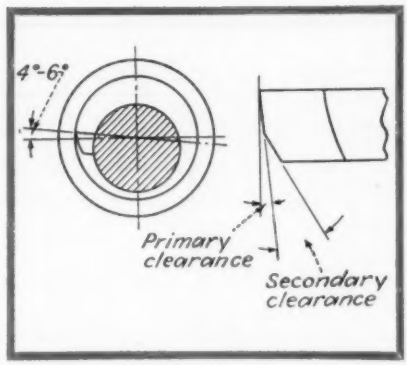
The piece is then reversed, faced to length and the 9/16-in. hole drilled through. The smaller end is bored and reamed to a 0.625-in. I.D. and 1 in. deep.

A standard V-block, mounted on the lathe cross-slide, holds the work on the centerline of spindle and tailstock. The 16-in. boring bar is 0.500 in. in diameter for half its length and duplicates the required taper for the remaining 8 in. It carries a ¼-in. carbide-tipped tool and has a V-shaped groove for chip disposal.

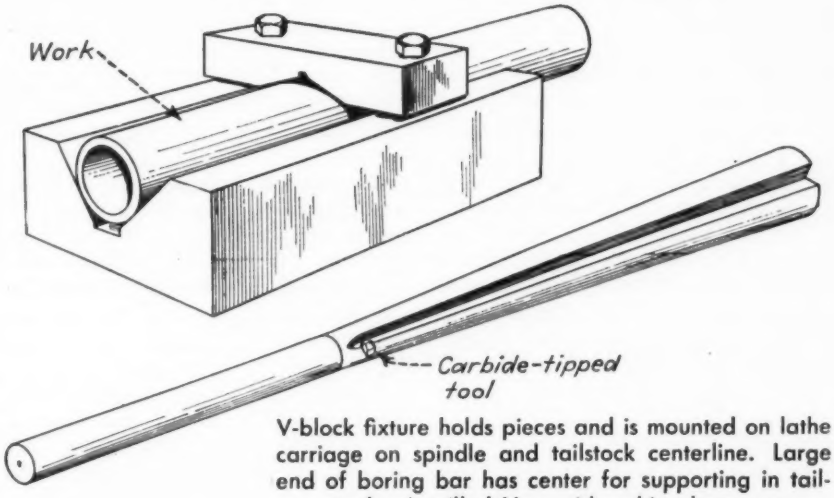
Bar is inserted through the work between centers, the small end being supported in a ½-in. collet. The taper attachment, set to desired taper, will traverse the work along the flycutting path of the boring tool, which should run at high speed. A rough-bore should leave at least 0.015 in. on the side for the finish-bore. *C. Stra, Bound Brook, N. J.*



Forces for position of tool at top tend to draw boring bar into the work and dampen chatter. A neutral setting meets average requirement

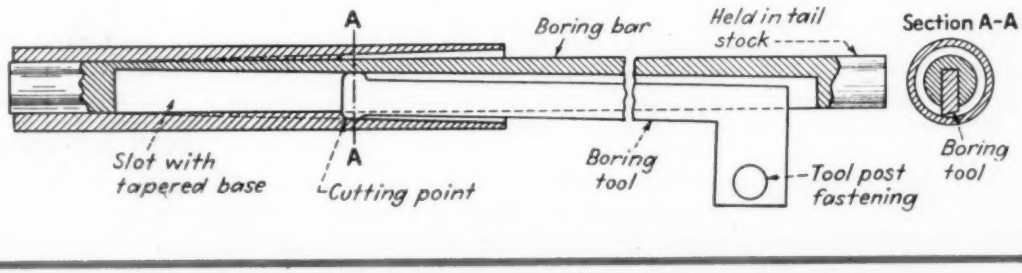


Downward spring of the tool is prevented by setting above center 4 to 6°. Secondary clearance provides added rigidity

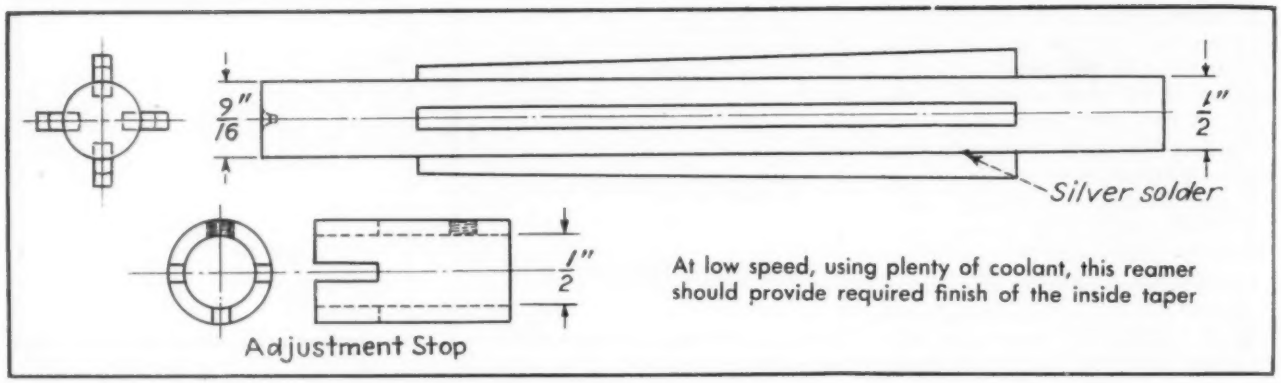


V-block fixture holds pieces and is mounted on lathe carriage on spindle and tailstock centerline. Large end of boring bar has center for supporting in tailstock. A milled V provides chip clearance

Slotted Boring Bar. An 0.625-in. diameter rod, turned to fit the hole in the small end of the taper and chucked on the tailstock at the other end, would supply the needed rigidity. A 3/16-in. slot, the bottom of which is of required work taper, is milled into the bar. A boring tool of 3/16-in. flat stock is ground to slide in the boring-bar slot. An integral cutting point is ground on one end and means of fastening the tool to the tool post is provided at the other end. The tool-post carriage then



Boring tool is bolted to toolpost, which feeds tool to required depth



At low speed, using plenty of coolant, this reamer should provide required finish of the inside taper

pushes the sliding tool and the cutter point covers the required taper as the work is rotated. *John Tyler, Annapolis, Md.*

Alter Bar Position. How about inverting the bar and bringing the tool to bear 180° from the normal position? With a feed of 0.0015 in., the tool may be ground with a sharp point and extreme side rake to reduce vibration. By reducing the finish cut to 0.002 in. instead of 0.005 in. the surface should be improved, and it would be feasible to finish completely each piece before removing it from the chuck. *A. L. Litchford, Bartlesville, Okla.*

Inexpensive Reamer. An inexpensive reamer may be made from cold-rolled steel rod and four high-speed steel blades. Rod is slotted and blades silver-soldered into the slots, the reamer then being put in dry ice. Blades are ground to desired taper and the rod ends ground and centered. Size and depth is maintained by an adjustable stop at the large end. Concentricity is obtained by finishing the O.D. on a mandrel. *Charles R. Stryler, Greenwich, Conn.*

Added Work Support. Have been working on your problem with two center rests set to make the straight feed on a lathe cut a tapered hole. A pilot can then be used on end of the bar and mounted in the tapered spindle hole of the lathe. Work will be driven with a dog, and shoulders on work O.D. run against steady-rest jaws to keep out end play. I have found that a boring bar of high-grade steel which has been mildly tempered gives a good degree of rigidity.

With a boring tool, I would keep the cutting edge of the bit about twice as wide as the feed. Not too much front clearance, with a good back and side rake should improve operation. Both the tool and work should be lubricated. *W. A. Ryan, Van Dyke, Mich.*

Rubber Work Jacket. On somewhat similar jobs chatter has been greatly reduced by slipping a hard-rubber tube over the full length of the O.D. Plastic tubing may also be used.

Another idea would be to set the boring bar 1/16 to 3/32 in. over centerline, causing chips to slide slightly away from cutting point and preventing down-pressure or drag-back against the boring bar. The taper attachment should then be suitably adjusted. Fairly high speeds will be possible if the feed is approximately 0.002 in. *T. M. Dunlevy, San Francisco, Calif.*

Depreciation Allowance Liberalized

BY HAROLD J. ASHE, TAX COUNSELOR

SEVERAL recent tax decisions indicate the government's adoption of a more liberal and realistic attitude in regard to special depreciation problems. These decisions now clearly sustain the right of the industrial taxpayer to deduct additional depreciation on his equipment and machinery to compensate for abnormal wear and tear. An accelerating rate of depreciation may now be allowed in any of several circumstances or combination of circumstances and, if properly supported by facts, the Internal Revenue Bureau may be expected to sustain the claim.

An employer, for example, may be forced to hire unskilled or improperly trained employees to do work formerly performed only by skilled men. This may account for increased depreciation. Or, he may find it impossible to get replacement parts as and when needed, with the result that the machinery wears out faster. Again, he may increase the work day from eight to ten hours and the work week from five to six days, with a fifty percent increase in the use of the machines; or he may put on a second shift where only one existed before, doubling the rate of depreciation.

Perhaps the taxpayer, because of production schedules, finds it impossible to make repairs as needed. Again, inability to get specific machinery for a certain operation may force him to use other machinery in makeshift fashion. This equipment, not designed for the operation, may depreciate more rapidly than if it were continued in the use for which originally intended.

All such claims for stepped-up depreciation on the part of the taxpayer should be properly documented to substantiate his claim at the time of audit by the tax bureau. Taxpayers who do not make such claims, or have them disallowed due to improper documentation, will be showing partially fictitious, but higher, net incomes, on which larger income taxes have been paid.

Solder Substitute?

LEAD-AND-TIN soldering alloys are non-existent today. Hudson bodies are soldered with antimony-lead alloys and production has been unhampered.

FOREMAN'S ROUND TABLE

How About Scheduled Maintenance?

"ROBIN HOOD has just been on his rounds again . . . says his boys are going to tear apart my best planer, starting tomorrow. You haven't got a machine you can lend me, have you, until he gets done, Ed?"

"Robin Hood? Oh, you mean the boss of the maintenance gang and his tricky green uniform, eh, Al? It's a lucky thing he comes around—you'd run every tool 'til it falls apart."

"Like the Devil I would, Ed. I never got in any trouble before this setup, did I? I may not believe in keeping everything polished to the nines like you do, but at least all my machines were in good working order when I had my own maintenance to do."

"Yeah, Al, they all ran, but that was because they were built right, not because you worried about how they were run or how long between fixings. Just so they kept up to production schedules."

"Modern tools are built to take it, Ed. They don't have to be coddled."

"But they're not like children; a little care doesn't spoil 'em or make sissies out of 'em. I believe Robin Hood has the right idea; a card file and regular care for every machine. Maybe the idea of dressing him and his boys in fancy uniforms is overdoing it, but he does keep after everything, even to chipped paint."

"That's because he doesn't have any production schedule to worry about, Ed. He oils and he tightens and he tests and he cleans but all he does is get my men sore and careless. They don't take any care of their machines at all anymore."

"They never did before, Al, and you know it—except for the few that are good housekeepers."

"Old grandmas, you mean, Ed, just like you and the rest of the toolroom crew. Always puttering. Won't put a new job on a machine until they clean up every chip, check oiling, inspect for trouble or such rot."

"That rot is my orders, Al. More good tools and jobs have been spoiled by carelessness in checking up and cleaning up than by any other thing. One chip in the wrong place and you're in trouble. That stuff can't go in a toolroom. I also check each machine every so often myself, to see whether it's aligned, whether bearings are tight, and so on."

"You're just adding to the overhead like Robin Hood does. We've got work to do out in the shop. I can't spend my day puttering around with machines and nursing 'em along. I believe in oiling 'em regular, cleaning 'em up each shift, and fixing 'em when they need it."

"Well, I believe in keeping 'em clean all the time, oiling and inspecting on schedule and fixing them *before* they break down. That's Robin Hood's idea, too."

"Yeah, you both belong out in the woods. Robin Hood and his Grease Monkeys, still playing with bows and arrows. By the way, Ed, what is Robin Hood's right name, anyhow? I don't believe I ever have known what it is."

SHOULD MAINTENANCE *be the job of the operator or an assigned crew? Is a schedule for repair and checkup sound? Does coddling make tools last longer and work better? Do you agree with Ed or with Al? Send in your opinions and ideas; those published will be paid for.*

Stack Cutting of Thin Sheets Produces Parts of Identical Contour

BY DR. G. V. SLOTTMAN, APPLIED ENGINEERING DEPARTMENT, AIR REDUCTION SALES COMPANY

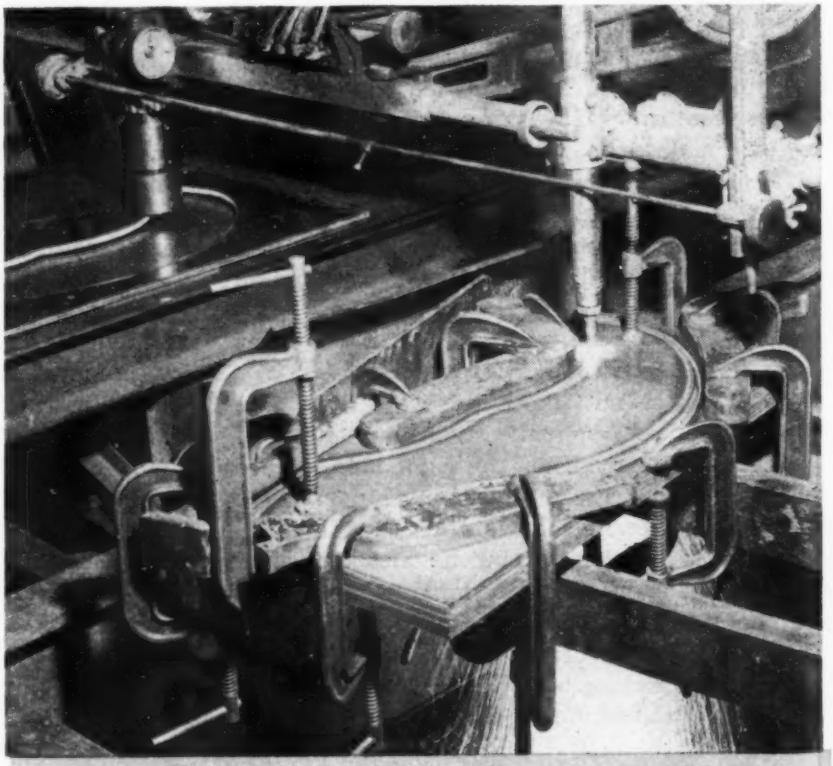
Methods of aligning, clamping and starting cuts on stacks of plates and sheets are reviewed in this tenth article of a series on oxyacetylene cutting

THIN SHEET or plate material presents a special problem in oxyacetylene cutting. Normally, if thin sheets of gage thickness were cut singly with the torch there would be considerable warping and melting of edges. Somewhat heavier material, say 3/16 to 5/16 in. in thickness, can be cut in single layers with entirely satisfactory results, but the economy is less than in cutting heavier material, the labor and gas costs being relatively higher. The process known as stack cutting is resorted to in these cases. Far from being a semi-satisfactory substitute used only because of necessity, however, the process brings its own advantages in the form of greatly increased production and economy.

Stack cutting is the process of piling a quantity of thin plates one on top of another, clamping the stack tightly, and cutting them as if they were a single homogeneous piece of heavy thickness. Thus six ½-in. plates, or as many as a hundred light-gage sheets, may be cut as one, without warping and with sharply defined edges.

Stack cutting is generally limited to sheets and plates up to ½ in. thick. In this field it is often used in place of shearing or stamping, particularly when the quantities needed are not large enough to warrant the expense of making dies. In contrast to shearing methods, the flame-cut sheets are square with no burrs or slivers. They may be formed subsequently in press dies without tearing at the edges, which frequently occurs when bending sheared edges with high stress concentrations that yield under the additional stress of the forming dies. Moreover, all parts are identical in contour, a condition which is difficult to secure by shearing methods. As compared to the cutting of single plates, gas consumption per finished piece is quite low, and the quantity of material produced per hour is much higher. Unit cost is accordingly low.

On the other hand, the amount of time required for setting up, and the additional cost of clamping devices, can be compensated only when the volume of work is large enough to justify these special efforts. Additionally, high-quality material



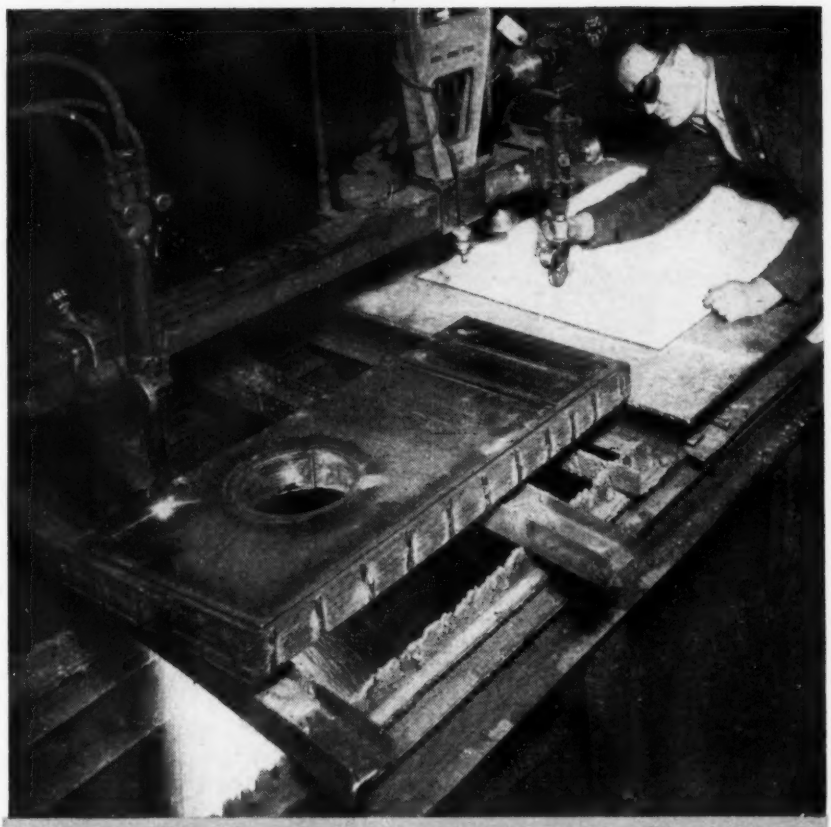
In cutting stacked plate, tight clamping along the line of cut is essential. One of the simplest ways is to use C-clamps, preferably supplemented by pressure-distribution bars as shown here. Ten ⅛-in. sheets are being cut simultaneously, using the same operating technique as for a single 1¼-in. plate. Stacks 3 to 4 in. thick are economical

must be used, and the actual cutting operation is somewhat more critical than standard cutting, involving a risk of spoilage of material. This hazard is virtually non-existent, however, when good practice is followed.

Advance preparation of material is most important to the success of stack cutting. In the first place, bent, crimped or warped plates should not be included in the stack unless first straightened. The individual sheets must also be cleaned of all dirt, mill scale, rust and paint. These precautions are necessary because spaces greater than about 0.003 in. between layers provide starting points for grooves. Slag or oxygen may spread out in such spaces, causing irregularities in the cut at that level, or even loss of cut. In stack cutting, loss of cut usually means wastage of the entire lot of material.

Cleaning is most important along the line of cut, as it is here that close contact is necessary. Depending upon the condition of the plate, cleaning may be accomplished by wire brushing, a compressed air blast or, in extreme cases, pickling or sandblasting. Thin sheets received fresh from the mill usually require little preparation other than a dusting off with compressed air or brush.

Total thickness of the stack is usually determined by the cutting tolerance required. With an edge tolerance of 1/32-in. an over-all thickness of not more than 2 in. is recommended, and with a tolerance of 1/16-in. the thickness may be as much as 4 in. When close tolerance is of no great importance it is generally more economical to use a larger stack, 3 to 4 in. being most common and recommended, though thicknesses of 6 in. have been cut. In the latter case the danger of air spaces becomes considerable due to the difficulty of maintaining tight clamping through that thickness.

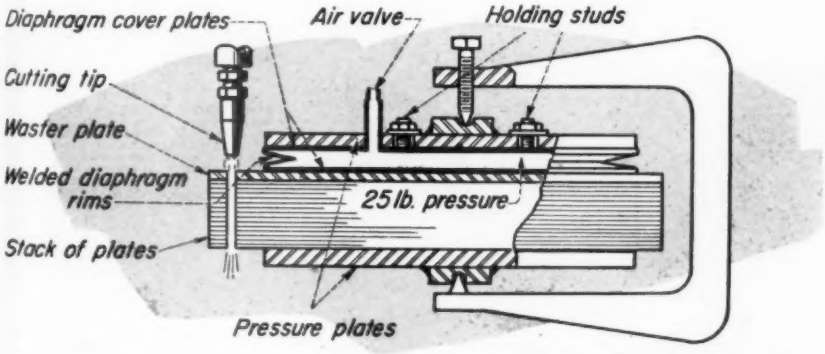


Another simple way to hold the stacked plates in intimate contact is by running weld beads across the edges while the stack is held under a press. The amount of space between welds is determined by condition of the plates, but about 5 in. is usually sufficient. Scrap remains held together and smaller parts can be cut from it

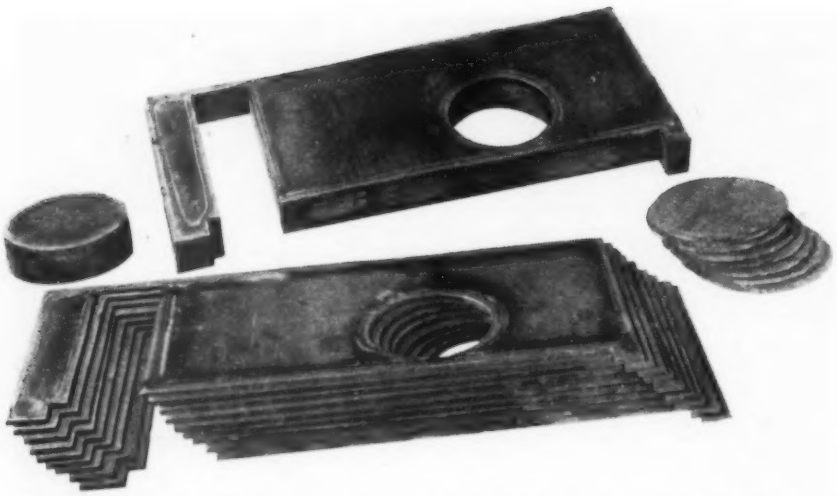
Plate which has been sheared prior to stacking may create air spaces between layers because of the raised, burred edges. This can be avoided easily by piling sheared plates with all burred edges facing upward, with the edges exactly in line so no spaces can form. Rounded edges should not face upward, as they have a tendency to deflect the cutting stream at the start.

When very thin plate is stack-cut there is a tendency for the top plate to warp and buckle because of the heat of cutting, thus creating a wide air space and often loss of cut. This is prevented by the use of a heavier "waster" or scrap plate, 3/16 or ¼ in. thick, clamped on top of the pile. This has sufficient rigidity to lie flat during cutting, and also serves to maintain ignition in the cut by its own combustion, thereby increasing the speed of cutting.

Clamping, by whatever method employed, should be applied close to the line of cut. Elsewhere, it is not important to have the plates tightly compressed. If the sheets are thin the pressure of the clamps themselves will be sufficient to close up the layers, but it may be desir-



Pneumatic pressure device for stack cutting. The bellows are slightly smaller than the outline of cut. Bottom pressure plate rests on cross members of worktable. The ¼-in. waster plate is customary when cutting thin sheets to prevent buckling of top sheet due to heat of cutting. A jig as elaborate as this is economical when large quantities of the same part are to be cut



The finished stack has an uninterrupted face as shown at rear, due to slight adherence between plates. However, they separate easily, revealing very square, sharply defined edges as seen in foreground

able with thicker sheets to press the pile together in a heavy press, and apply the clamps or tack welds while in the press, then remove them for cutting. This is helpful if any of the plates are slightly bent; otherwise it is usually sufficient to pound with a heavy hammer along the line of cut while increasing the pressure on the clamps. This serves to expel air from between the layers and assure close contact.

The most versatile and most readily available clamping device is the C-clamp. These may be spaced uniformly along the edge of the stack, and should be pulled up tightly with the aid of a wrench. Their small contact area is a disadvantage which can be overcome by the use of pressure-distribution bars. They are not very effective when pressure must be applied near the center of the stack for the cutting of central openings. For this purpose a strongback operating through wedges or stud bolts may be employed. A simpler device to use here is the U-clamp, which may be simply a flame-cut frame or fork of any throat depth, used in conjunction with steel wedges driven between the top leg of the clamp and the top of the stack.

Another common method of holding the stack is to run weld beads down the edge at intervals of about 5 in. This practice is particularly handy when cuts are to be made so close to an edge as to preclude the use of clamps. A press should be used to compress the sheets while the beads are deposited. This method is not effective on wide plates where cuts must be made at the center, but it may be supplemented by U-clamps in such cases. The welds should not, of course, be made on edges which will not be cut off as scrap. An incidental advantage of this method is that the scrap is held together after cutting, should it be desired to cut smaller parts from the scrap.

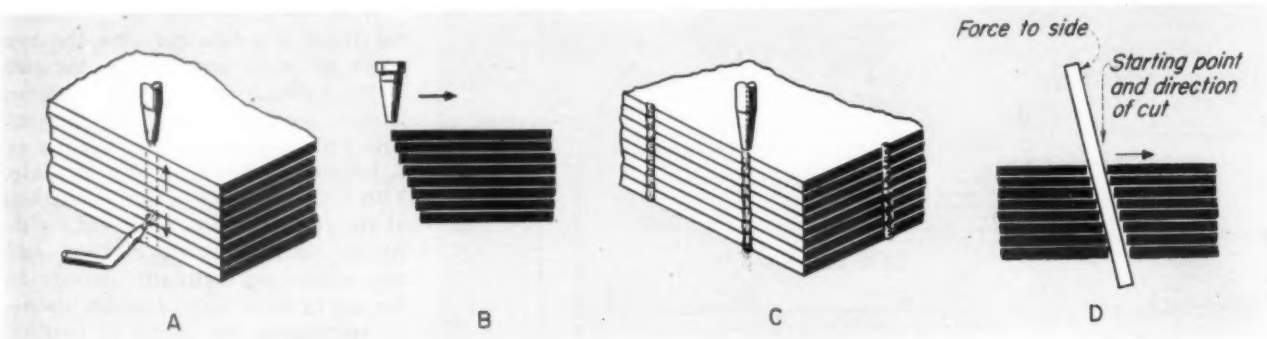
Fast-acting toggle clamps are convenient, provided they exert sufficient pressure. One advantage of this type of clamp is that in making long cuts a few such clamps can be progressively removed and replaced ahead of the torch as the cut progresses. They should not be relied on for heavy work, however, or on thick stacks requiring heavy pressure.

When bolt holes will be required in later stages of fabrication, such holes may often be utilized in the stack-cutting operation by clamping with a row of bolts. The same technique can be used to hold the center of a pile of plates in close formation, by running a bolt through holes drilled or punched through an area which will become part of the scrap.

Methods for Starting Cuts

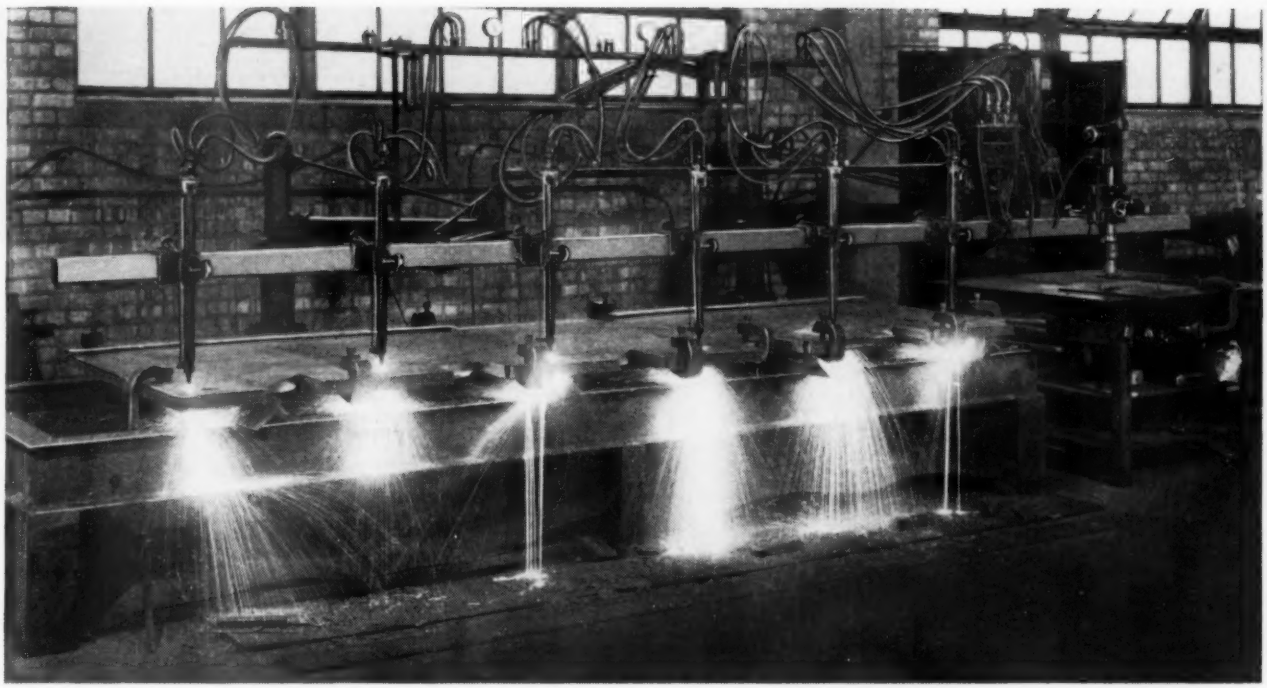
A correct procedure for starting the cut is almost as important as proper clamping of the stack. Failure of cut at the start is more likely to occur in stack cutting than in cutting a solid piece, and such failure may spoil the entire group of plates. There are three common methods of starting, and the method to be used should be taken into account when the plates are initially aligned and clamped.

First there is the preheated-edge method. At the starting edge the plates are aligned so all edges coincide in a vertical line. It is essential that no one plate shall project



METHODS OF STARTING THE CUT

(A) The preheated edge method. An oxyacetylene welding or cutting torch is moved up and down the face of stack until a line is heated to ignition temperature. Then the machine cutting torch is brought into action. (B) The staggered stack method. Cutting starts easily through top plate and progresses through succeeding plates as torch is advanced. Line of cut must fall within bottom plate edge. (C) Starting at bead weld. Continuous metal at this point makes starting easy. (D) Starting an inside cut at drilled holes. The holes may be aligned vertically or staggered by inserting a bar and forcing it to one side. Starting is same as at (B)



The advantages of multiple-torch cutting and stack cutting may be combined to produce many identical parts in a single operation. This six-torch Oxygraph is cutting six ¼-in. plates at once. Note the wide spacing between clamps; this is possible when plates are perfectly flat

beyond or recede back of this line, as the cutting action would be interrupted at this point. A vertical strip along the face of the stack is preheated with a hand torch until the entire line is heated to ignition temperature. The machine cutting torch is then quickly positioned above this line and cutting starts.

Another procedure is to align the plates so each starting edge projects slightly over the one below. Cutting is started at the top plate, and as the torch advances the cut penetrates through one plate after another until all plates have been penetrated as the torch reaches the line of cut.

The third method is to start the cut at a vertical weld bead which joins all the plates. This method is effective because at the weld the metal is continuous rather than being separate plate edges. If desired, the weld may be preheated with a hand torch, as described above, before starting the cut.

The starting of inside cuts is somewhat more critical than starting at outside edges. The preferred method is to drill a starting hole after the stack has been assembled and clamped. If this cannot be done, and the plates are drilled or punched individually, care must be exercised to remove the burrs from each hole and to arrange the plates so that the holes are in perfect alignment. A bolt or drift pin inserted in the holes at the time of clamping helps to insure true alignment. The cut should then be started carefully, making sure penetration is complete before reaching the line of cut

Cutting Speeds Reduced

Once the cut has been satisfactorily started, cutting proceeds in the same way as through a single piece of material. The operating technique is the same except that slightly lower cutting speeds are preferred to insure against loss of cut. Some operators employ a slightly increased oxygen pressure for the same purpose, contingent upon the flow capacity of the tip. The new divergent-nozzle, high-speed tip has been found particularly suited to stack cutting, because the unusually high velocity of the cutting jet enables it to carry ignition across any slight gaps that may exist between plates.

The finished pile of stack-cut parts presents a smooth, continuous face, indicating a very light fusion or slag adherence between layers. Microscopic examination has shown the depth of this fusion to be only about 0.005 in. If the individual sheets are 10-gage or thicker they can be easily separated by dropping the pile to the floor or pounding with a hammer. Long pieces will usually separate if one end is lifted to permit the stack to bend.

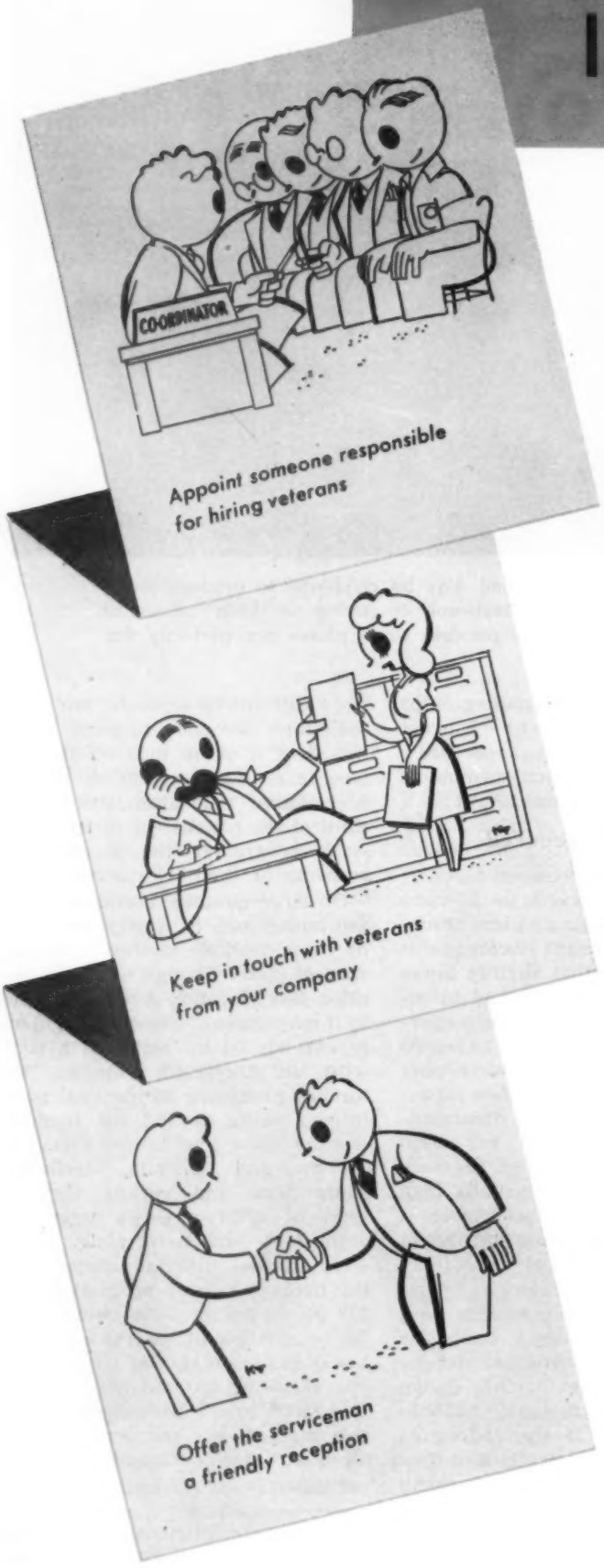
Sheets lighter than 10-gage are more difficult to separate, and it is sometimes necessary to grind a few thousandths of an inch off the cut face to promote separation. It has been found that after about one-third of the cut surface of the fused stack is ground, the sheets then separate of their own accord.

On large-quantity production jobs the output can be vastly increased by using multiple torches in cutting stacked plate. Though not often applied, this operation is not as critical as it may appear. One shop regularly cuts six ¼-in. plates at a time with an Oxygraph carrying six torches, producing 36 identical parts in one swing around the templet. Records show that in one period of 15 hr. and 50 min., including setup time and cutting time, a total of 2,724 pieces were cut from 3/16- and ¼-in. plate. These were of four different shapes, but the average rate of production was 172 pieces per hr. The pieces were fairly small, but expressed on a linear basis the rate of cutting was approximately 3,000 in. per hr. Close to 100,000 pieces have been cut by this method—six torches cutting a six-plate stack—without a single reject.

The next installment of this series will discuss cuttability of various steel and the effects of cutting upon steel.

Industry Cooperates

Booklet distributed by Cleveland organization is typical of the data passed out voluntarily to ease employment problems for servicemen


COORDINATOR
Appoint someone responsible for hiring veterans
Keep in touch with veterans from your company
Offer the serviceman a friendly reception

HIRING of war veterans as new employees and reinstatement of men who left their jobs to fight a global war are two major tasks receiving attention of Selective Service officials. By stressing the fact that these comparatively young men represent an opportunity for industrialists and businessmen, officials are refuting the impression that returning servicemen form a "problem."

Industry and business have given their hearty endorsement to the broad program of providing employment for returning veterans. As a whole, management has cooperated to the fullest with the Selective Service System in assisting discharged veterans to regain the jobs they left to enter service. But the task of helping the great majority of servicemen and women who are not returning to their old jobs is one of the major responsibilities of industry.

A typical example of voluntary cooperation in this movement is represented in a booklet prepared and distributed by the Cleveland Chamber of Commerce. It contains common-sense advice obtained from the experience of many personnel men and presents sample forms to assist prospective employers in preparing and maintaining up-to-the-minute data on veteran applicants.

Many similar examples can be cited in the form of comprehensive booklets prepared by individual companies who have made exhaustive studies of the legal and human aspects of laws relating to veterans.

Maj. Laurie C. Green, Assistant Information Officer, Selective Service System, asserts that officials throughout the nation have found management responsive to the need for understanding of the veteran and his individual problems. Local Selective Service boards have established and are maintaining close liaison with business and industrial leaders within their communities and the readiness of management to cooperate has contributed immeasurably in the organization of the veterans' assistance program.

Hundreds of thousands of veterans being discharged never had jobs. Large numbers of them went from high schools and colleges directly into the service. These veterans are entitled to aid in finding jobs under provisions of Section 8 of the Selective Service Law. Further, the G.I. Bill of Rights states that it is the intent and purpose of Congress to provide an effective job-counseling and employment-placement service for all veterans to afford them "the maximum of job opportunity for gainful employment."

in Hiring Veterans

The general principles for reintegration of veterans to economic life do not establish legal rights to specific jobs. There is no doubt, however, that the great majority of employers and the great mass of employees want to see these principles equitably applied, and undoubtedly they will be. Unfortunately, the people in the communities where jobs exist and veterans are seeking them have not always been permitted to solve their problems in their own way.

It has been the experience of Selective Service in administering the employment provisions of the law that problems concerning the veteran and his desire for a job can be worked out most satisfactorily at the local level. It is for that reason that the major responsibility in carrying out this phase of the program has been placed upon the local boards and their reemployment committeemen, with a minimum of interference from State and National Headquarters.

Local Boards Qualified to Assist

Throughout the nation, an effort has been made to encourage the veteran seeking a job to call upon his local board for assistance. The board members and reemployment committeemen have been schooled in rendering this service to the veteran. They know that it is their job to find a satisfactory solution to the veteran's situation without sacrificing any of the veteran's right. They have been instructed to use the aid of other government agencies, veterans' groups, labor, management and civic organizations.

In this connection, the Cleveland C. of C. booklet advocates that firms designate one individual as responsible for veterans' employment. This individual should know what is required of the firm, what the laws are, and what agencies there are in the community to assist the veteran.

Under Sec. 8 of the Selective Training and Service Act of 1940, the private employer is required to restore the veteran to his former position or to afford him a position of like seniority status and pay, if

1. He left a permanent or regular position for service or training required under the Act; provided
2. He has satisfactorily completed such service or training as shown by his discharge papers.
3. He is still qualified to perform the service required by the position in question.
4. He makes application within the specified time.
5. The employer's situation has not changed much.

The Cleveland organization suggests that military-service information will be useful to employers in helping bridge the gap between the veteran's military and civilian employment. Job analysis, including a study of those jobs that will suit handicapped veterans, is stressed.

While the majority of returning veterans will not be handicapped physically or mentally, those who are disabled will be anxious to receive jobs that afford

Conduct a careful placement interview
Find out how postwar training fits serviceman
Make check-ups of the veteran's progress

MILITARY SERVICE RECORD

Employees in Service

Name _____ Dept. _____ Clock No. _____

Date _____

Date left for Military Service

Branch of Service entered _____

Principal locations of Service:

Rank attained:

Citations and awards:

In-Service training:

Correspondence Received:

By _____ Answered _____

By _____ Answered _____

By _____ Answered _____

Visits to our organization while in Service:

Last known military address:

an opportunity to get ahead and succeed. Thus it is advisable that a check be made of all jobs that can be performed by handicapped personnel.

Physical examinations for veterans should not be any different than those given any other new or reinstated employees. Injuries and medical difficulties should be fully investigated at the time of medical examination so intelligent placement can be made and the employee treated properly in the future. One company uses a simple check-list to determine whether the applicant is physically qualified to perform his old job or another job.

Injured Vets Study Industry

In this connection, Major General Norman T. Kirk, Surgeon General of the Army, reports that injured war veterans in the many Army hospitals are given a chance to study occupational aspects of industry. Training kits are assisting disabled servicemen to learn new occupations and they serve as therapy treatments.

TABLE OF LIKE JOBS

in terms of status and pay

TO ASSIST IN REEMPLOYMENT OF FORMER EMPLOYEES

Job Title (Last permanent job of employee in service)	Rate	Changes in Job Since May 1, 1940		Jobs of Like Status and Pay		
		Date of Change	Explanation	Job Title	Rate	Training and Education Required

EMPLOYEE INVENTORY SHEET

Estimated Personnel Requirements:

Total Number of present Emplys. _____ 5

No. Expetd. to ret. from Mil. Serv. _____ 3

TOTAL _____ 6

Est. No. Req'd - Post War _____ 4

Total To be added _____

Total to be reduced _____ 2

Job Title (or group) Widget Assembly

Dept. C

Div. _____

Dept. Supvr. West

Date 4/3/45

List above employees in mil. service, then list pres. temp. employees

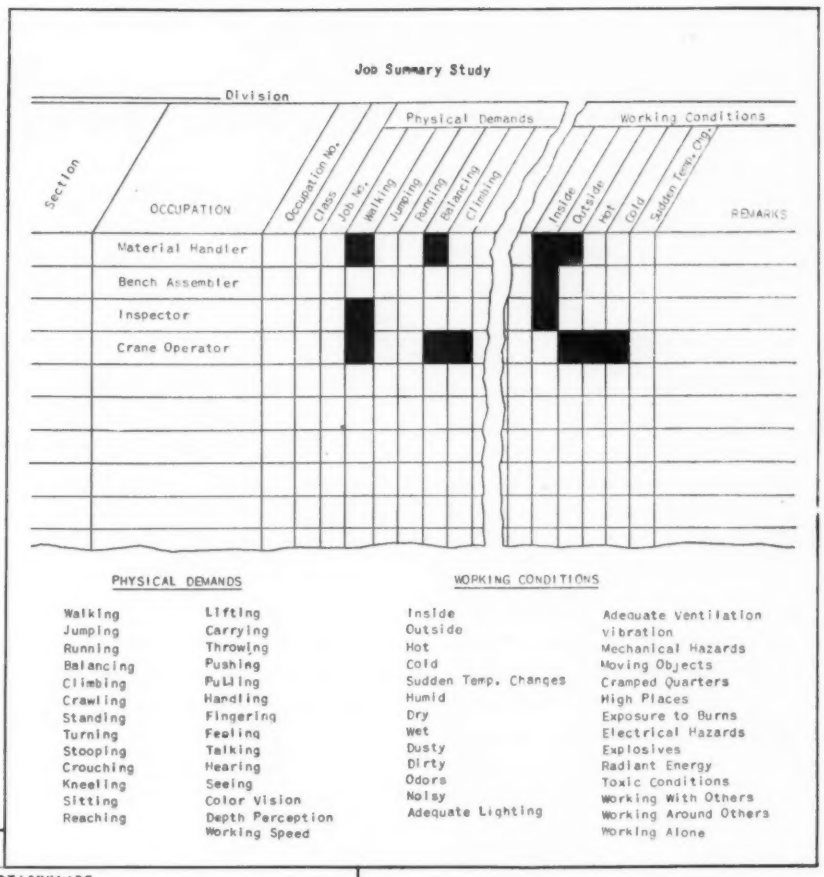
NAME	Status T	Status P	Service Mil.	Service Tot.	Age	Rating	Rank in Group	Ave. Earn.	Remarks	Release	Ret. on Job	Transfer
Jones, A. P.		x	24 mo.	60 mo.	26	23	2	.73			x	
Smith, C. C.	x		30 mo.	36 mo.	33	42	5	.75			x	
Spelvin, Jos.		x	42 mo.	78 mo.	28	20	1	.78	Consider for Supervision		x	
Doakes, Jos.	x			58 mo.	38	33	4	.75	Transferred from Dept. x			To Dept. x
Patrick, W. T.	x			120 mo.	40	31	3	.77	Transferred from Dept. A		x	
Watt, Jesse	x			20 mo.	37	45	6	.75		x		

The first experimental program was launched at Deshon General Hospital, Butler, Pa., and is in the process of being expanded. Two training programs have been established: "A" or bedside training; and "B" or field training. Army Signal Corps training films augment the programs.

Many men with little or no mechanical leaning have entered the training programs enthusiastically and indicate they are interested in following up certain types of industrial work upon their return to civilian life. Chevrolet's war-products field organizations are credited with bringing direct aid from industry to the disabled veterans' training program. A.C. Spark Plug Division has been active in helping at Percy Jones General Hospital, Battle Creek, Mich.

Typical Kit

A.C. kits include accessories which it manufactures, instruction books and diagrams of various parts showing how they are assembled. Bedside kits include the finished accessory, tools necessary to take it apart and reassemble the part, and a lap board or tray with space to hold the entire kit. Patients engaged in the training program at Jones General are amputees.



Job Summary Study

Division

Section | OCCUPATION | Occupation No. | Class | Job No. | Physical Demands: Walking, Jumping, Running, Balancing, Climbing | Working Conditions: Inside, Outside, Hot, Cold, Sudden Temp. Chgs. | REMARKS

Material Handler
Bench Assembler
Inspector
Crane Operator

PHYSICAL DEMANDS

Walking, Jumping, Running, Balancing, Climbing, Crawling, Standing, Turning, Stooping, Crouching, Kneeling, Sitting, Reaching, Lifting, Carrying, Throwing, Pushing, Pulling, Handling, Fingering, Feeling, Talking, Hearing, Seeing, Color Vision, Depth Perception, Working Speed

WORKING CONDITIONS

Inside, Outside, Hot, Cold, Sudden Temp. Changes, Humid, Dry, Wet, Dusty, Dirty, Odors, Noisy, Adequate Lighting, Adequate Ventilation, vibration, Mechanical Hazards, Moving Objects, Cramped Quarters, High Places, Exposure to Burns, Electrical Hazards, Explosives, Radiant Energy, Toxic Conditions, Working With Others, Working Around Others, Working Alone

EX-SERVICEMAN'S QUESTIONNAIRE

Date_____ 194____

Name_____ Address_____ Phone No._____

Rank_____ Branch of Service_____ Length of Service From____ To____

Duties_____

Date of Mil. L.O.A._____ 194____

Did You Serve Outside of The U. S.	Yes	Pacific Area ☐ European Area ☐	How Long? From To
	No		Date of Discharge 194
Reason For Discharge:			

Were You Previously Employed Here	Yes	Dept. Foreman
	No	What Company? City

Reason For Not Returning To Last Employer:_____

What Was Your Occupation Before Entering Service:_____

If Unable To Do The Same Work, State Reasons_____

If Seriously Ill, Injured Or Wounded In Service, State Details:_____

Are You Handicapped As A Result?____ How?_____

Are You Receiving Compensation Because of This Disability? Yes____ No____ What %_____

Do You Plan To Make Cleveland Your Home?_____

List Any Special Skills, Training Or Education You Acquired In Service	Length of Time
1.	
2.	
3.	

I understand that since I have not returned to my last civilian employer, my status at the [redacted] would be exactly the same as that of any other employee who had not been a member of the armed forces of The United States and that my continued employment would be controlled in part by the amount of seniority which would accumulate from this time forward.

I also understand that there may be a reduction in the working force later, due to a large number of former [redacted] employees returning from the U. S. armed forces, after the cessation of hostilities.

Remarks:_____

Counsellor_____ Vet. Signature_____

Tool Use Taught

Veterans able to leave their beds can go to the hospital's machine shop and learn the use of power tools. All tools in the shop were contributed by the machine tool industry. Demonstration equipment, such as charts, have been supplied by various divisions so the war veteran trainees will be eligible for automotive jobs when they are discharged. Patient morale is rated as high.

Often veterans will appear to have difficulty in deciding the line of

THE FORMS presented herewith are those suggested by the Cleveland Chamber of Commerce in its booklet "Veterans Must Get Jobs."

APPLICATION FOR REEMPLOYMENT
Record of Interview with Returned Veteran

1. Name _____ Check No. _____
2. Soc. Sec. No. _____
3. Sex _____ 3a. Martial Status _____ 3b. No. of Children _____ Dependents _____
4. Date of Birth _____
5. Residence (Street-City-State-Telephone No.) _____
6. Works _____
7. Last Occupation _____ 7a. Department _____
8. Date Left For Service _____
9. Date Inducted Into Service _____
10. Date Discharged _____
11. Discharge Form No. _____
12. Experience Or Skills Acquired In Service _____
13. Rank and Unit When Discharged _____
14. Branch of Service _____
15. Serial Number _____
16. Request Leave of Absence _____ From _____ To _____
17. Request Reemployment on: (Check One)
    a. Last Occupation _____
    b. A Different Occupation _____ Name Occupation _____
    Give Reasons For Preference _____
18. Veteran's Signature _____
19. Date of Application For Reemployment _____
30. Interviewer's Signature _____

(FRONT)

STATUS OF EMPLOYEE RETURNING FROM MILITARY SERVICE

1. Does Applicant Have Legal Reemployment Rights? Yes ____ No ____
2. Result of Physical Examination: Class _____

Applicants With Reemployment Rights	Applicants Not Possessing Reemployment Rights
3. Applicant Has Reemployment Rights To: Occupation _____ Dept. _____	7. Reason Applicant Does Not Possess Reemployment Rights? (a) Replaced Other Employe in Military Service _____ (b) Employed For A Temporary Occupation _____
4. Applicant Is Qualified To Perform The Duties Of This Occupation Yes ____ No ____	8. Applicant Was Last Employed On _____ Occupation in _____ Department
5. Other Occupations Offered: _____ Date	9. Occupations Offered: _____ Date:
6. Reemployed On: _____ Occupation In _____ Department On _____ Date (a) If Other Than Occupation In (3) Above, Give Reasons. _____	10. Reemployed On _____ Occupation In _____ Department On _____ Date

Not Reemployed - Give Reasons For And Date Of Decision. _____

Future Of Person Executing This Form _____

(BACK)

A permanent record can be made of the information obtained on the back and front of this form

work in which they are interested. Here aptitude tests are important. With rare exceptions, veterans are entitled to testing and guidance, conducted by the Veterans Administration.

Many employers will want to train veterans through vestibule (pre-job), apprenticeship, on-the-job, or merely refresher training courses. When this is done, employers should familiarize themselves with subsidies available to veterans under Public Laws 16 and 346 (78th Congress) where the training programs meet specified government standards. The Veterans Administration can do an effective job of offering training to veterans only if it is aware of all the qualified programs which exist in the community.

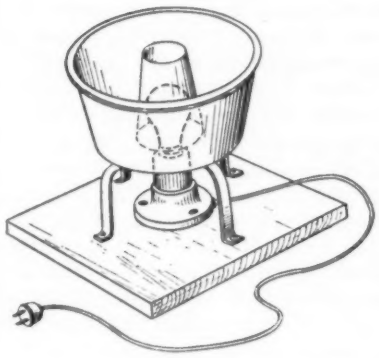
Improper job placement of the veteran may bring out weaknesses not recognized at the time of job assignment. It is quite important, therefore, that a systematic, periodic, follow-up plan be adopted. A qualified man for this follow-up work might be one of the former servicemen already back at civilian work.

Rating reports are important and usually include attendance, willingness to work, quality of work, orderliness, attitude toward fellow workers, and attitude toward supervision.

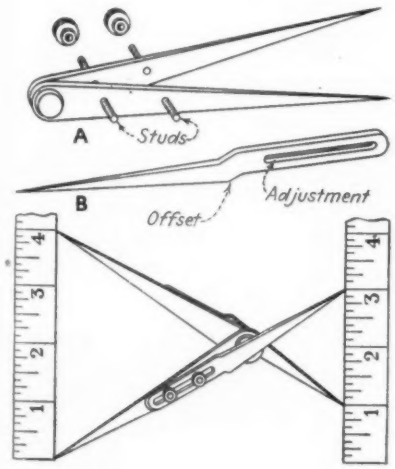
Preparation and maintenance of adequate records in connection with the hiring of veterans as new employees and the reinstatement of returning servicemen are emphasized. They will afford a valuable reference list in answering any questions involving veterans' employment.

Short Cuts FOR THE SMALL SHOP

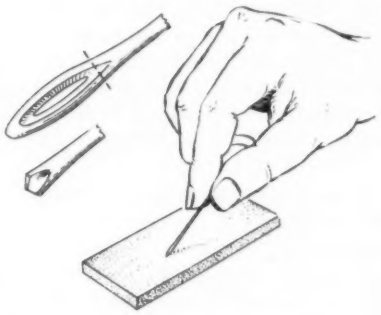
BY A. H. WAYCHOFF



ELECTRIC GLUE HEATERS are made easily and inexpensively from the "angel food" type cake tins and are more convenient than the water bath. Make four strap-iron legs to support the tin so the conical center opening fits over an electric lamp screwed into a lamp base mounted on a board. A 25-watt lamp is usually large enough. The heating action can be hastened by placing a can lid over the center tube in the cake tin, and regulated in the same manner. This heater is handier than a water bath and costs little.

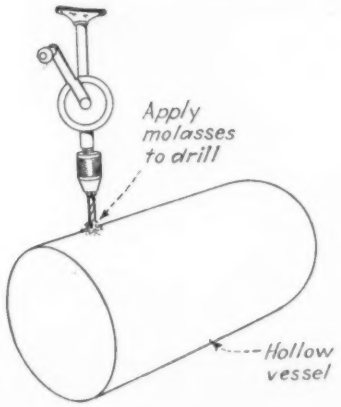


PROPORTIONAL DIVIDERS that will not fold up unexpectedly when enlarging models or similar tasks can be made as follows: Drill and tap two small holes in each leg of a pair of flat-blade dividers, such as those shown at *A*. Set small studs in these holes. Then make two slotted auxiliary legs *B* from thin steel. These blades should be made with an offset so that they clear the divider joint. Assemble the auxiliary legs to the dividers with small round, knurled nuts. To set the proportional dividers to say a 2:1 ratio, open the flat-blade dividers to 4 in. on one scale, loosen the nuts holding the auxiliary legs and slide them until their points span 2 in. on a second scale. Then tighten the nuts. Various other ratios are easily obtained if the adjustment slots are made approximately 3 in. long.

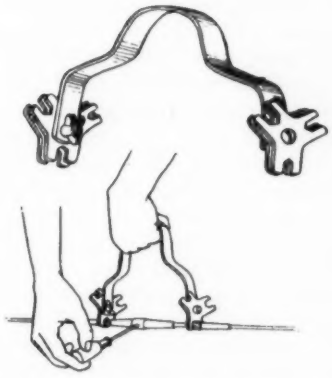


TINY DRILLS can be made from sewing needles by the following method: Select a size of needle with the eye flattened to a width somewhat greater than the hole diameter wanted. Break off the eye, and sharpen the remaining flat to a spear point by whetting the corners on a fine stone or emery paper cemented to glass. If done carefully, the whetting process will produce cutting lips on the opposite sides of the spear point.

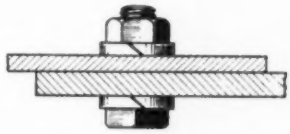
MOLASSES helps to prevent chips from falling inside tanks and other hollow objects when drilling holes in them. Merely apply the sticky fluid to the drill with an oil can. The molasses will catch and hold fine chips rolling in the drill flutes and the chips will stay with the tool until removed from the hole.



BAR SOLDER can be used up practically to the last bit by soldering a wire handle to one end. Take a piece of No. 8 wire and form into a handle, then solder to the partially used bar of solder. When the bar is not in use, the handle makes a good hanger, and can be slipped over a convenient nail.



Turnbuckle Wrench—This tool springs over the nuts on the swaged cable ends, stays in place by itself and can be held in one hand while the barrel is tightened with the other, thus eliminating the services of the other man formerly required. *Roy Carley and Frank Cenerini, Naval Air Station, Quonset Point.*



Blind Bolt Stopper—When confronted with the problem of fastening bolts in concealed locations, such as electric refrigerator mountings, the bolt or screw head can be prevented from turning during tightening by placing a lockwasher under its head prior to assembly. *Thomas Trail.*

Revised Gear-Blank Tolerances Cut Costs

BY K. E. BAUERLE, GEAR ENGINEER, SPERRY GYROSCOPE COMPANY

Revised gear-blank machining tolerances, sound design and proper evaluation of required quality puts instrument-gear manufacture on efficient basis

REVISED machining and tolerance practice is one of the most immediate requirements for any appreciable reduction in manufacturing cost of fine-pitch instrument gears. Obsolete design and unnecessarily close machining tolerances threaten progress in cost reduction and achievement of maximum functional value. The need for such revision and review of practice is jointly recognized by the A.G.M.A., the A.S.A. and instrument and gear makers. As a result, their cooperative efforts are leading to improved practice.

Economic production of good gears depends largely on quality of the blanks. A badly designed blank, even if machined to close tolerances, is still inadequate if dimensional proportions and tolerances interfere with proper mesh of mating gears. Tooth depth, fillet and edge interference, duration of contact betwen mating gear-tooth profiles and pitchline runout are elements which must be considered by the designer at the time the blank is dimensioned for machining.

Arbitrary determination of tolerances and specifications should be avoided. What represents a liberal allowance for the outside dimensions of a spur gear may become an exceedingly small and costly tolerance for a fine-pitch gear if its tolerance specification is determined by making the tolerance proportionately smaller.

Blank tolerances should be limited in scope for minimum interference with the meshing quality of gear teeth and to provide adequate limits for economical machining. The subsequent operation of cutting the teeth is the dominating requirement which must be facilitated by all preceding operations.

Fine-pitch gears are classified by the A.G.M.A. in two groups: Commercial and Precision. Each group has three classes. The composite errors described are the bases for evaluating relative quality and are exclusive of errors in masters.

Tooth-to-tooth composite error is the error shown as a flicker on the indicator of a variable-center-distance fixture as the gear rotates from tooth to tooth in intimate contact with the master. Flicker shows the effect of these composite errors: circular pitch error, tooth thickness variation and profile error.

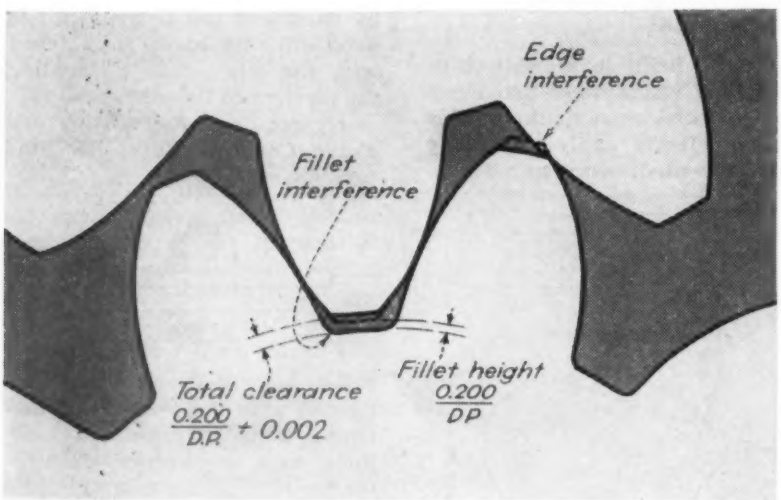
The total composite error is made up of runout, lateral runout and tooth-to-tooth composite error. This error is the total center-distance displacement read on the indicator.

Gears in the commercial group can usually be produced on available gear-cutting machines and tools in good operating condition, without resorting to special techniques or subsequent refining operations.

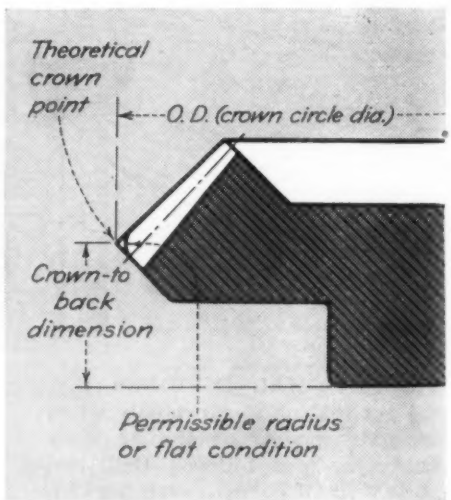
Gears in the precision group will usually require the best available precision gear-cutting machines and tools in good operating condition. Subsequent refining operations such as shaving, grinding, lapping and special techniques may be required. Gear-blank elements requiring toleancing with respect to the various classes listed in Tables I and II are:

SIZE

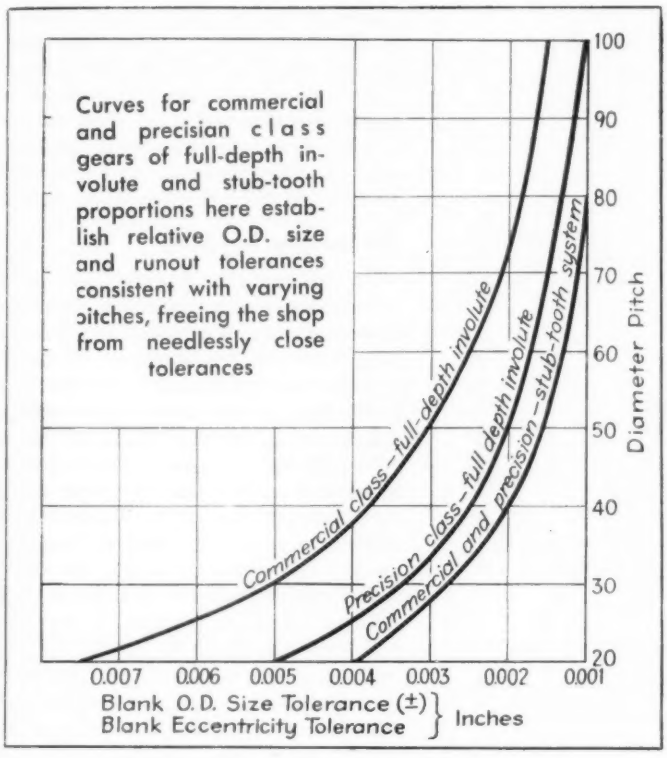
- O.D. size and tolerance for External Gear Blanks—Non-topping
- O.D. size and tolerance for External Gear Blanks—Topping
- I.D. size and tolerance for Internal Gear Blanks—Non-topping
- I.D. size and tolerance for Internal Gear Blanks—Topping
- O.D. size and tolerance for Bevel Gear Blanks
- "Bank to top" dimension and tolerance of Rack tooth—Non-topping
- "Bank to top" dimension and tolerance of Rack tooth—Topping

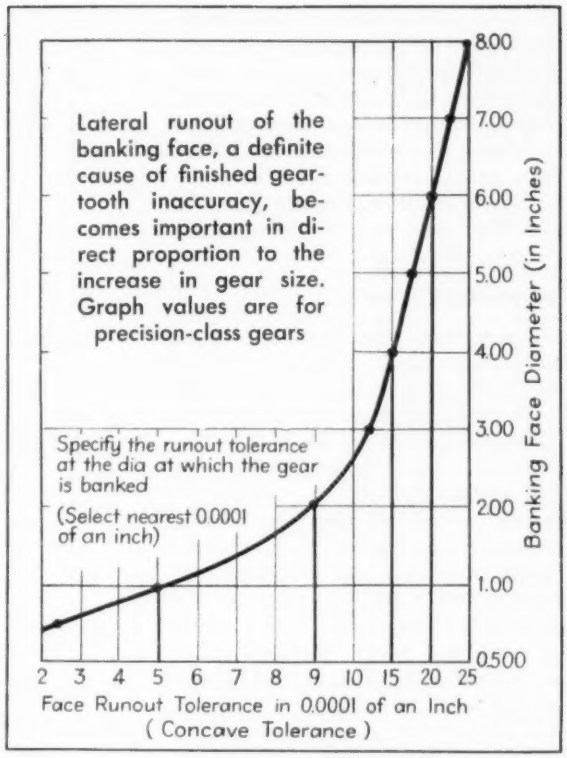


Fillet and edge interference, tooth depth, duration of contact between mating gear-tooth profiles and pitchline runout must be considered when the gear blank is dimensioned



A variation from the theoretical crown point is permissible as a radius and does not affect functioning of mating parts




Lateral runout of the banking face, a definite cause of finished gear-tooth inaccuracy, becomes important in direct proportion to the increase in gear size. Graph values are for precision-class gears
Specify the runout tolerance at the dia at which the gear is banked
(Select nearest 0.0001 of an inch)
Banking Face Diameter (in Inches)
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.500
2 3 4 5 6 7 8 9 10 15 20 25
Face Runout Tolerance in 0.0001 of an Inch
(Concave Tolerance)

RUNOUT

- O.D. Runout tolerance for External Gear Blanks—Non-topping
- O.D. Runout tolerance for External Gear Blanks—Topping
- I.D. Runout tolerance for Internal Gear Blanks—Non-topping
- I.D. Runout tolerance for Internal Gear Blanks—Topping
- Front angle tolerance for Bevel Gears
- Banking-face lateral runout tolerance (all gear parts)
- Concavity tolerance of banking face (all gear parts)
- Convexity tolerance of banking face (all gear parts)

BORE AND SHAFT SIZES

- Bore size tolerance (all holed gear parts)
- Shaft size tolerance (all shaft gear parts)

STOCK ALLOWANCES

- Broaching stock allowance
- Borizing stock allowance
- Grinding stock allowance
- Lapping stock allowance
- Burnishing stock allowance
- Topping stock allowance
- Pre-shaving stock allowance

Since tooth height of fine-pitch gears must be controlled closely, because of the relatively small amount of root clearances, it becomes imperative that O.D. size and runout be considered together if fillet interference, edge contact and erratic contact are to be avoided.

A gear blank made to the upper tolerance limit of a specified O.D. dimension will be passed by the inspector for size. However, if at maximum dimension the O.D. is not perfectly concentric with the bore or the shaft on which the gear is mounted at assembly, interfering tooth action will result when two gears with maximum O.D. size and runout are meshed together.

Extreme accuracy of O.D. or I.D. runout with the bore or shaft on which gears are mounted is not essential if tolerances are properly apportioned functional requirements of gears in mesh, rather than to satisfy inspection specifications of hypothetical value.

The only harmful effect caused by reducing the O.D. of external gears is a loss of contact ratio. In fine-pitch gears the minimum satisfactory duration of contact is considered to be 1.2. A study of the duration of contact between two 10-tooth pinions reveals that O.D. tolerances can be safely increased to the equivalent of from 10 to 15% of the working depth of the tooth.

A typical example of this is an assumed 20 DP gear with 60 teeth. Specifying an O.D. tolerance of 10% of working depth would result in a conventional O.D. specification of:

$$\frac{N+2}{DP} + 0.000 \text{ in.} - 10\% \text{ of working depth} = 3.100 + 0.000 \text{ in. and} -0.010 \text{ in.}$$

For reasons previously stated, working to the upper limit is to be discouraged since it penalizes production by holding O.D. runout to zero when working to the upper limit. It is therefore recommended that for production purposes the O.D. of gear blanks be specified according to the formula $\frac{N+1.9}{DP}$. This will result in an O.D. specification of 3.095 in. and permit a total eccentricity of 0.005 in. or a runout of 0.010 in.

The application of this formula (for production purposes only) is an approach to the solution of relative O.D. size and O.D. runout specification which is at once practical and economical. For a 100-pitch gear the tolerance would be plus or minus 0.001 in. with a total permissible runout of 0.002 in., a tolerance easily held by machines in good working order. If this tolerance proves a hardship it should be remembered that it is based on an O.D. reduction of 10% of the working depth. The tolerance could safely be increased by basing it on 15% of working-depth reduction.

The values for O.D. reduction and runout tolerance for an intermediate fine-pitch range of commercial and percision class gears of full involute and stub-tooth proportions are given in an accompanying graph and represent the O.D. dimension of $\frac{N+1.9}{DP}$.

Thus, relative O.D. sizes and run-

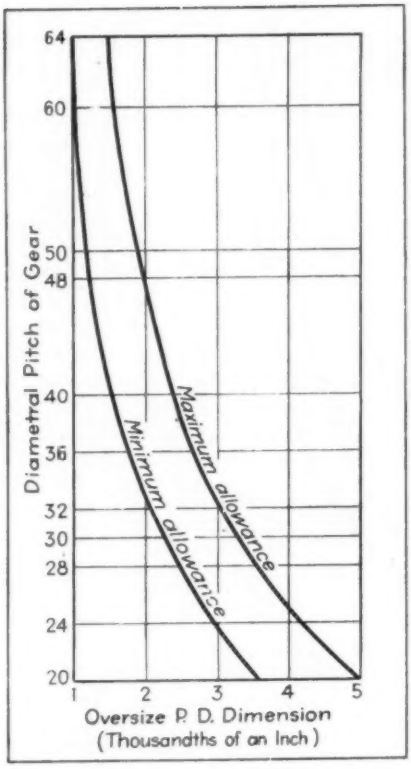
out tolerances consistent with varying pitches are established by the curve. It properly considers both elements as inherently inseparable, frees the shop from needlessly close tolerances, and eliminates the possibility of interfering fillet or edge contact, maintaining ample duration of contact without sacrificing functional requirements.

Tolerance Curve

In this same graph the precision tolerance curve is based on 10% of working depth and the commercial class tolerance is based on 15% of working-depth tolerance limit. The tolerance values indicated by both curves should be used only when the element containing the teeth of the respective class of gear is dimensioned according to the formulas given in Table III. For external and internal circular gear parts which are gear-cut from finished bores, the control of bore sizes and proper specifications of permissible tolerance limits is a principal requirement for achieving accuracy in subsequent gear cutting or finishing operations. While the machining of good bores which are straight, true round, to size and square with the banking faces of the blank appears to be costly, this cost represents only a fraction of the waste if the finished gears are rejected for excessive runout because of bore discrepancies.

The accuracy of the bores of holed gear blanks and the shaft diameter of shafted gears generally represents the frequency of success with which all subsequent gear cutting, gear finishing and gear assembly operations can be performed. With the exception of those gears which are finish-bored while nested on the topped O.D., or held in pitch-line chucks, it is the dominating element in successful production and assembly of all precision gears.

If it is assumed that among the common gear-tooth errors such as runout, profile error, spacing error and variation in tooth thickness, runout is responsible for more than 50% of all discrepancies, as indicated by composite check, then the maximum permissible bore tolerances would be as in Table IV.



Recommended stock allowance for finish-shaving 14½° pressure-angle gear forms. For 20° and 30° pressure-angle use 75% and 50% of graph values

The mounting of gear blanks for the gear-cutting operation calls for rigid clamping against a banking face, a condition rarely duplicated at inspection or assembly. The control of banking-face runout (lateral runout), although frequently underestimated as a cause of finished gear-tooth inaccuracy, is a factor which must be fully recognized. Lateral runout of the banking face, causing misalignment between mating-gear-tooth profiles, cross-bearing conditions at assembly and eccentricity due to deflection of the work arbor, becomes important in direct proportion to the increase in gear size. Precision class gears cannot be efficiently produced if this element of gear-blank discrepancy is ignored.

Lateral runout of the banking face is extremely harmful in bevel-gear-tooth generation as it produces a combination of tooth profile displacement in both planes. A precise study of the relative effect of this blank discrepancy on finished-gear performance has not yet been made. The values in an accompanying graph are the result of observation and experience rather than mathematical determination, and are recommended for precision class gears.

Evaluating Topping

In evaluating topping of gear teeth, the process offers a number of advantages. For instance, a topping hob can be made to produce a slight radial chamfer on the top land edges of the teeth, eliminating interference during approach and recess cycles. A topped gear can be inspected on the O.D. to check concentricity of the P.D. This would facilitate economic quality control of work-in-process since the size and concentricity of the generated O.D. is a good indication of the size and concentricity of the P.D. An indicator stand, equipped with a radial shoe to suit the curvature of the periphery of the generated O.D., would constitute a simple and effective production inspection means.

Topped gears could be inspected for runout at assembly after they have been pinned securely to the shafts. This would give the assembler a valuable additional means in his search for the causes of noise and erratic mesh of apparently accurate gears. The O.D. turning operation could be eliminated in some instances and O.D. tolerance for blank turning increased.

A topped O.D. would furnish the element from which to bank or pilot the gear for subsequent finish-boring or grinding of the bore or shaft of a gear. To achieve extremely high functional accuracy, such as may be required for Precision Class III gears, this method of machining may have to be employed, and topping would furnish the means.

Blank tolerances pertaining to the face angle, back angle and the "crown to back" dimension of fine-pitch bevel gears have already been established in A.G.M.A. Standard No. 206.01. However, the disposition of the O.D. or crown-circle size tolerance for fine-pitch gears is too arbitrary and unnecessarily close.

TABLE I
TOLERANCES FOR COMMERCIAL FINE-PITCH GEARS

CLASS	TOTAL COMPOSITE ERROR, IN.	TOOTH-TO-TOOTH COMPOSITE ERROR, IN.
Commercial 1	0.006	0.002
Commercial 2	0.004	0.0015
Commercial 3	0.002	0.001

TABLE II
TOLERANCES FOR PRECISION FINE-PITCH GEARS

CLASS	TOTAL COMPOSITE ERROR, IN.	TOOTH-TO-TOOTH COMPOSITE ERROR, IN.
Precision 1	0.001	0.0004
Precision 2	0.0005	0.0003
Precision 3	0.00025	0.0002

A study of the O.D. or crown-circle diameter reveals that this dimension is relatively unimportant and that a considerable variation from theoretical size is permissible without affecting the functional requirement between mating bevel-gears.

A certain flat condition on the crown is permissible. If form tools are used to produce the blank shapes, a flat or radius condition is unavoidable since it is physically impossible to produce or maintain a sharp vertex point on the form tool.

Therefore, it is recommended that limits of permissible flat or radius conditions be established on the crown point and tied up with the O.D. size and tolerance. This will facilitate economic production of bevel-gear blanks and stop arbitrary interpretation of permissible flat or radius condition on the point.

Inspection Means Created

If the form tool is found correct in producing the proper angular relation of the front cone face and the back cone face, and the distance between the theoretical crown point to the banking face from which the gear is mounted at gear cutting or assembly, a valuable and simple production inspection means has been created. The blank-turning operator will be able to maintain uniform quality by periodic micrometer measurement checks on the O.D. after approval of the first piece.

A study of the graph reveals that O.D. tolerance can be much more liberal than those generally specified by designers without sacrificing precision functional requirements.

Among the factors to be considered in seeking the most economical blank machining processes are the material, job-lot quantity and required quality of the finished gear. Here again, knowledge of required gear quality will be of great value to the manufacturing engineer in selecting the proper processes and sequence of machining operations prior to the gear-cutting operation. Design information, such as in commercial class 3, will convey to the manufacturing engineer data on finished gear quality requirements.

Commercial class 1 and 2 gears, for instance, would not require finish-turning operations. The blank machining process would be to rough-turn, drill and ream, finish-turn ad break sharp edges. Commercial class 3 and precision class 1 gears would require a finish-turning operation after the reamed hole has been broached or borized to size on a precision boring machine.

TABLE III—GEAR-TOOTH DIMENSION FORMULAS

GENERAL GEAR DATA				PRECISION CLASS	COMMERCIAL CLASS
TYPE	ELEMENT	TOPPING OR NON-TOPPING	GEAR SYSTEM	FORMULA	FORMULA
External Gears	OD.	Non-Top	Full-Depth Involute[1]	N+1.9 DP	N+1.85 DP
		Top		N+2.4 DP	N+2.4 DP
		Non-Top	20° Stub Tooth System	N+1.5 DP	N+1.45 DP
		Top		N+2 DP	N+2 DP
Internal Gears	I.D.	Non-Top	20° F.D.S.A.[2]	N—1.1 DP	N—1.05 DP
		Top		N—1.6 DP	N—1.6 DP
Racks Face Gears	"Bank to Top" Dim.,[3]	Non-Top	Full Depth Involute[1]	Given "Bank to Top" dim.—5% W.D.*	dim.—7.5% W.D.
		Top		Given "Bank to Top" dim.+20% W.D.	dim.+20% W.D.

*W.D. = Working Depth of Tooth
[1]Std. F.D. = Standard Full-Depth Involute System (14½°—20° P.A.)
[2]Std. F.D.S.A. = Std. Full-Depth Short Addendum System (20° P.A.)
[3]"Bank to Top" = Dimension of distance from banking face to top of tooth face.

TABLE IV—MAXIMUM PERMISSIBLE BORE TOLERANCES

CLASS OF GEAR	MAXIMUM BORE SIZE TOLERANCE, IN.	MAX. SHAFT SIZE TOL. FOR SHAFT GEARS, IN.
Commercial 1	+0.002	—0.002
Commercial 2	+0.001	—0.001
Commercial 3	+0.0005	—0.0005
Precision 1	+0.0003	—0.0003
Precision 2	+0.0002	—0.0002
Precision 3	+0.0001	—0.0001

TABLE V—BLANK MACHINING TOLERANCES

FINISHED BORE SIZE	BROACHING Max. Min.	BORIZING Max. Min.	GRINDING Max. Min.	LAPPING Max. Min.	BURNISHING Max. Min.
In.	In.	In.	In.	In.	In.
Up to 0.249	0.003 0.002	0.008 0.006	0.008 0.006	0.0004 0.0003	0.0003 0.0002
0.250-0.499	0.004 0.003	0.010 0.008	0.010 0.008		
0.500-0.999	0.005 0.004	0.012 0.010	0.012 0.010	0.0005 0.0003	0.0004 0.0003
1.000 & over	0.006 0.005	0.015 0.013	0.015 0.012		

Provided the proper machine-tool facilities are available, the sequence of operations would be as follows:

(1) Rough-Turn, Drill and Ream:
Automatic screw machine if greater than 500 quantity lots.
Hand screw machine or high-speed turret lathe if less than 500 quantity lots.

(2) Broach or borize to size:
Horizontal 1 to 2-ton broach.
Borematic or precision borer.

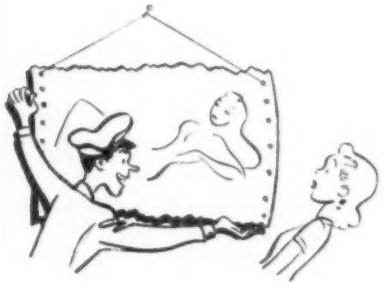
(3) Finish-turn O.D. and banking faces square with bore.
Break sharp edges:
High-speed engine lathe or second-operation lathe.

(4) Inspect:
For precision bores with tolerances of 0.0004 in. or less, use air gage.

Gear-blank machining operation for precision class 2 & 3 gears usually requires special finishing processes in addition to the precaution taken for commercial class 3 and precision class 1 gear blanks.

Such additional operations as cylindrical or rotary face grinding of the O.D. and the banking faces, honing or lapping of the bores after finish turning and boring may be necessary to prepare the blank for high-precision gear cutting.

TALKING SHOP



Alloy Art

SCRAP ALUMINUM SHEET, with the surface treated to speed oxidation, is being used to replace canvas for oil painting. Saves stretching the canvas, avoids difficulties with moisture and such, and is claimed to give a long-wearing and thoroughly satisfactory surface. The idea undoubtedly came from the popularity of highly imaginative oil-color "pin-ups" on bombers.

Profits to Poverty

WHEN the postwar president of a screw-machine product company took over recently, he discovered that 75 to 80% of the orders kept a machine busy less than a day. Setup costs were literally eating up profits —so the company was going broke with business booming. His flat instructions to salesmen to accept no order for less than a two-day run brought squawks aplenty, but is giving the red ink a long-deserved rest.

Land-born D. E.

CLEAR among our wartime recollections is the railroad car shop that was induced to take a subcontract on compound-curved bow and stern sections for destroyer escorts—although the nearest navigable water was some miles away. Stern sections could be assembled bulkhead down, but the bow was too big—it had to be assembled on one side. Even then, the overhead crane had to stay away while final plates were set. The sections were tackwelded together, final-welded into the biggest sections that would fit a railroad gondola, then the tacks cut for dismantling and shipping.

Know-how Beats the Expert

THE REASON behind this queer subcontract was the shop superintendent —an expert on heavy-plate forming. Later on, the plant took a contract for 3-in. and 5-in. Navy gun shields of heavy armor plate, shaping the compound curves by progressive U-die "bumps" on a 150-ton crank press—a job that ordnance men swore couldn't be done on anything under a 2500-ton hydraulic. They forgot that "mony a mickle makes a muckle"—but the shop man didn't.

Mistakes in Print

AN OLD FRIEND reminds us, after discussing a couple of recent errors, of the old saw that once appeared on the walls of many country-newspaper offices:

"When a preacher makes a mistake, nobody knows the difference . . .

When a garage man makes a mistake, he adds it to your bill . . .

When a lawyer makes a mistake, it's just what he wanted, because he has a chance to try the case all over again . . .

When a judge makes a mistake, it becomes the law of the land . . .

When a doctor makes a mistake, he buries it . . .

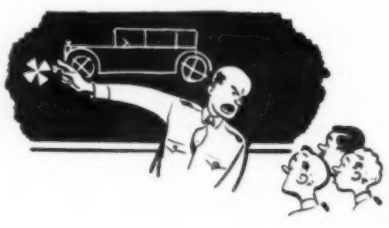
BUT, when an editor makes a mistake—GOOD NIGHT! The whole world knows it!

Sweet Photomicrograph

WHEN PHOTOMICROGRAPHY was young, a practical joker brought in an interesting shot of what he suggested (but didn't *say*) was steel. After all staff metallurgists had rendered their opinions of what was wrong with the sample he'd pictured, he said negligently: "I forgot to tell you—it isn't steel, but just a closeup of a sugar cookie!"

Foxholes Needed

THE NATIONAL SAFETY COUNCIL reports more casualties among civilians than among the armed services during the war. Returning veterans should be warned before they get home.



Symbolic Seat

MONEY may make a mare go, but machine shops make a war go. There have been many stories of barge shops in the Normandy invasion, the Seabees' off-the-cuff shops in the Pacific, and the Navy's floating workshops that support our fleets. Now comes the story of an Army Engineer shop, set up in what was first a Filipino cock-fighting arena, then a Jap barrel factory. There a Bullard boring mill worked beside a captured Jap lathe; doughboys, skilled Filipinos and released internees alternated in running them. Parts were cast in an adjacent foundry, the prize casting being a strangely symbolic one—a commode cast from Jap scrap. It was undoubtedly made for one purpose only —to reconvert high-point men to Stateside customs.

THE FIRST THING needed to make a dream come true is to wake up.—*Church Management*

IDEAS are funny things: they won't work unless you do.—*The Villager*

TIPS for Top Shop Men

8 Servility has no place in a democracy — because it always must be accompanied by arrogance. The man who bows and scrapes to you expects his subordinates to do the same to him; just as a butler insists that the maids show his stuffed shirt deference.

9 The coldly superior attitude is as obsolete as the horse and buggy. Even the services have turned thumbs down on the blind-obedience-to-orders policy. Take time to explain as often as necessary, to show other human feelings than rage and disdain. Americans work better and longer as a gang than as individuals.

Timely Action on Parts Coding Will Avoid Postwar Confusion

Now is the time to get rid of haphazard practices which give rise to errors and cause much time to be lost in the various departments requiring positive identification of specific parts

BY JOSEPH CALLAHAN

COURTESY OF ROL-DEX COMPANY, DETROIT

Punched and non-punched parts-code and inventory sheets are almost always prepared according to individual requirements. Filing equipment is also built to specific needs such as size and quantity of cards used

RECONVERSION is bringing into use many temporarily discarded parts and vast numbers of completely new part units, especially in industries that switched products abruptly to war necessities. What better excuse can be found for revamping the parts-coding system and modernizing the files?

The following coded specimen and its translation show how a row of figures describing a part save a lot of record space and a lot of breath:

Specimen: 060-01-009-6-60

Translation: Gasket — stainless steel — hot-rolled, hexagonal-shaped casting—to U. S. Government specifications—for 4 in., Style XX bronze safety valve

Classifying unrelated parts other than by chronologically assigned part numbers is a generally recognized need. Parts in hand or on order must frequently be grouped by name, basic material, form or shape, origin of activity, purpose, assembly, or finished product for which the part is finally used. Ordinary part numbers cannot produce this information without a staggering amount of cross-reference work, but with an intelligently devised covering code, items can be segregated quickly into almost any pre-determined category.

Rigid, inadequate coding systems have failed to keep pace with demands caused by variations in the composition of old parts, temporarily or permanently discarded material, additions to regular stock items, and totally new special-purpose parts made or purchased to meet changing specifications. Original coding systems, therefore, are often altered in a haphazard, unscientific fashion, usually by adding distinguishing alphabetical symbols to established designations. The following symbols represent two kinds of hair springs:

A477382XXXYYYZZZ
A477382XXYYYYZZZ

This combination is awkward because it is exceedingly difficult for the eye or ear to distinguish the solitary variation in the alphabetical sequence following the numbers. "Skimming through" such figures and letters is really a succession of eye jerks. Fleeting pauses for iden-

tification must take place at each unit. Multiply this example by tens of thousands of near-identical sequences used in toolcribs, stock records and perpetual-inventory systems, and you get a faint idea of the great risk of error.

Another common weakness in coding systems is that each plant department often prepares a system for its own special purposes without consideration of general purposes or needs. Then parts, purchasing, cost, production and sales departments must constantly interpret codes to each other—at an extra cost in time, energy and patience. Although departmental purposes do vary, common ground for agreement on some particulars strengthens any internal code structure.

Setting Up a Code

Logical code construction, therefore, aims at a flexible, semi-permanent code integrated as much as possible with general plant needs. Breakdowns into logical patterns are accomplished by determining the required number of units in each set of figures representing a category, and blocking off categories by intervening spaces or dashes for quick identification. If for example 750 part names make up one classification or category and 20 basic commodities complete a second classification, the code starts with a three-position sequence followed by a two-position sequence, as in the following models:

000 00
or
000-00

The most quickly recognizable classification positions are at the beginning and end of a sequence. These positions are naturally allotted to symbols of commonly required identities. If few references are anticipated to the form or shape of a part, that information should not be given first or last. Here is an eleven-digit code developed to fit the needs of one foundry with 45,000 parts:

Part Name
000—Spindle, nozzle, screw
Commodity or material
00 —Stainless steel, cast iron, phosphor bronze
Shape or form
000—Tube, casting, hot or cold rolled
Activity or origin
0 —Stock item, obsolete, outside purchase, Government specifications
Purpose
00 —Assembly, style of gage or valve, fluid pressure scales

Note that no categories use more than three digit positions. This limitation is an advantage because four-position sequences are difficult to memorize. Anyone who doubts that a satisfactory breakdown of 45,000 parts can be made with only eleven digit positions in all is reminded of the scores of millions of people classified in Social Security codes of only twelve digits.

Reserve Favored Combinations

Since code figures have nominal values only, it is practical to use "favored combinations" of figures for rapidly moving parts, reserving chronological sequences for gaps between these favored combinations to list new parts of the same kind. Supposing that steel is the chief basic commodity in the parts inventory with iron a runner up, and three-digit positions are to be assigned to represent the commodity item, the following code specimen could develop:

Carbon steel —111
Stainless steel—112
Cast iron —666

All additional steel items now fall logically into the 110 series, and the iron items into the 660 series, leaving less favored figure combinations to cover other basic commodities. As the code is used repeatedly, employees begin to understand much of its meaning without reference to decoding devices.

The figures 1, 0, 6 and 9 are easy to write and read. They are not mistaken easily for other figures. These are the ones, therefore, that logically form the favored combinations around which the code structure is built.

In every category are likely to be a few miscellaneous unclassifiable items that are not covered in specific definitions for coded numbers. One continuously repeated figure like 9 in all categories identifies such items much more readily than separately selected designations for each group.

Items classified as miscellaneous in all categories

Haphazard system 729-83-420-13
Logical system 999-99-999-99

Letters of the alphabet are not objectionable if they do not run to confusing length. Alloys may be prefixed with the letter *A*, or special assemblies with the letters *SA*. Tacking on chains of *X*'s, *Y*'s and *Z*'s to established codes, however, is a lazy, bewildering way to refine code values.

Experience with normal routine work flows is a great asset in setting up favored and less favored combinations, because much depends on expected activity. Assuming that a manufacturer of steam gages is interested primarily in the name, composition and purpose of parts, the following combinations could be worked out:

(1) Part Mat. Use
Intensely active item using favored combination 066—096—116
Translation: Dial—black finished brass—for 4½-in. bronze—tube duplex gage.

(2)
Less active item using less favored combination 377—578—745
Translation: Special case — cast aluminum — for special low-pressure recorder.

Note: If composition and purpose of this item were the same as in example 1, two-thirds of the sequence would then revert to the original, making the code read as follows: 377—096—116

(3)
Partly miscellaneous or unclassified item using repeated 9's 999—999—857
Translation: Miscellaneous item—unclassified composition — for liquid level recorder.

Note: Miscellaneous listings are used sparingly, as it is usually more satisfactory to identify an item. In this case the "part" was purple ink of unknown composition for the specified recorder.

Card System Has Advantages

For keeping track of coded parts inventories, cards are almost always preferred. In electric punch-card machine systems, the blocking off of figure sequences by spaces or dashes is unnecessary because prepunched machine cards can be run through an interpreting machine to give detailed word values. Cards may be sorted in tubs, revolving wheels or visibly indexed vertical registers.

For volume handling of active cards, however, a specially constructed file with a series of removable trays on steel wheels is exceedingly efficient. With this filing arrangement one operator can manage from 3,000 to 60,000 cards without reaching, stretching, stooping or stirring from her seat. At a slight movement the records roll to the operator's finger-tips. Records can be covered with a dust-tight cap when not in use. No extended drawers interfere with others wanting to use files of this sort. Information seekers work from the outside.

Practical Ideas

HAVE YOU A PRACTICAL IDEA?... If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

Precision Blade-Grinding Fixture Built From Scrap Materials

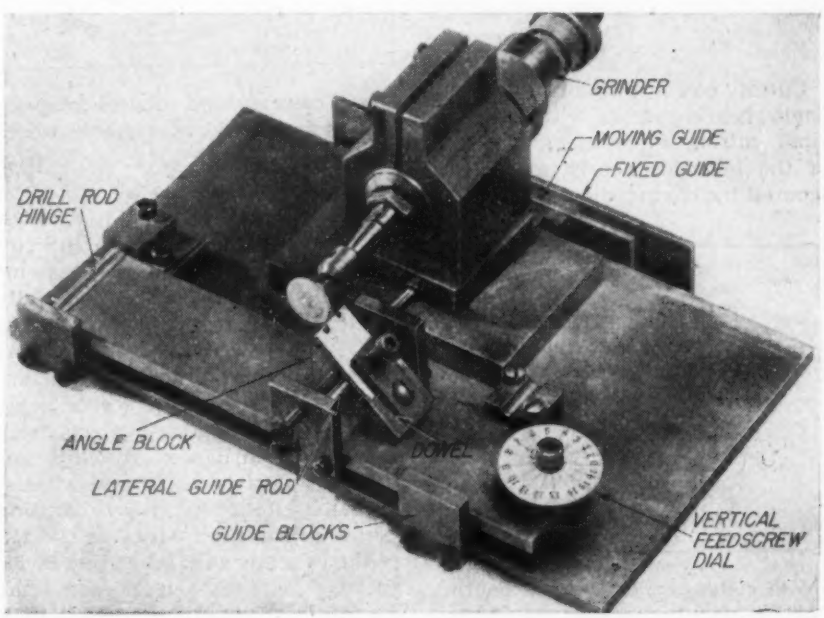
CHARLIE WESLOW

An electrical manufacturing company required about two dozen blades for its insulation-stripping machines. These blades, operating in pairs, form an accurate circular hole, which is relieved to an ellipse on the reverse side, making two chisel cutting edges. To assure clean, quick stripping of the wire, the specifications called for very close tolerances. The semi-circular notches were carefully ground and checked in a previous operation, and the cutting edges were formed using this fixture.

Three directions of control are required. The free motion (hand control only) is the sliding of the superspeed turbine air grinder longitudinally on the baseplate, guided only by its projecting finger between the edge of the plate and an additional clamped-on plate. The feature of the fixture is its sensitive vertical feed, obtained in a simple manner without the conventional feedscrew and expensive ways. A long, hinged leaf carries the workrest at its longitudinal center, and vertical feed is secured with a knurled-socket capscrew (¼-28). This means that the work moves only one-half the distance the screw travels, or one full turn equals 1/56-in. The third direction of motion, lateral positioning, is obtained by two opposing knurled screws which bear on the workrest as it slides on its drill-rod guide.

Since the designer and builder of this small grinding machine was also to be its operator, no effort was made to dress it up other than to assure the required accuracy, and, in fact, the materials for its construction came almost entirely from the scrap pile. The cold-rolled baseplate was left as is on one side because the effective travel of the grinder would be only an inch, and the other side was ground to hold accurately the hinge and guide blocks. The leaf is ground on both sides to eliminate backlash and is pivoted on a drill rod, pinned and screwed to its end. The blades (0.750±0.0002-in. wide) can be removed and exactly replaced at any time for checking because of the nest doweled to the angle block workrest. This block, guided by the drill rod, was ground off providing a few thousandths clearance between it and the leaf to prevent sticking. The dial on the vertical feedscrew provides a check for resetting when the process is interrupted for cleaning and oiling.

The 1-in. diameter wheels had to be carefully contour-ground with a templet and dressed frequently, but the work was so fussy that copper sulfate was used to observe the final cuts and be sure that the profile was correct. At that, two or three thousandths were left at the cutting edge for hand honing.

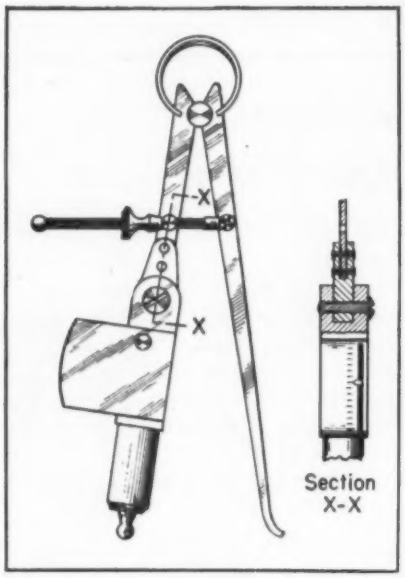


Long hinged leaf on this grinding fixture eliminates expensive feed-screw and ways, yet it provides very fine vertical feed

Sensitive Indicating Calipers for Plug Gage Work

DONALD R. TRYER
Oregon Brass Works, Inc.

There are times when a number of holes of an odd size are to be bored with close tolerances but no plug gage is available to check them. This tool was developed for a specific job(but since has proved valuable for various jobs. In measuring the out-of-round and longitudinal variations of worn engine cylinders, for example, its quick adjustability and indicating dial make it quick to operate, and its plus or minus 0.007



Spring calipers, converted to take a center indicator, make an emergency inside micrometer

in. range gives plenty of scope on either side of any basic dimension.

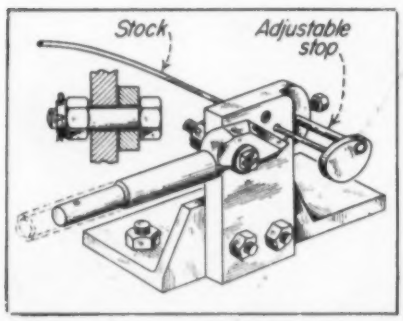
The illustration shows a pair of inside spring calipers, with one leg cut off and fitted with an eye to accommodate the center indicator. The latter comes with a handle, merely laid aside until the dial gage is needed for its intended purpose.

Wire-Cutting Device Has Powerful Leverage

J. R. NESETH
Kaiser Company, Inc.

Cutting power is obtained by a low angle shearing stroke with the principal cutting force along the axis of the lever or nearly so. This is secured by having the moment arm of the cutter very short, making it travel in an arc of small radius with the knife actually cutting along its entire length.

The main frame bracket is drilled for three basic wires sizes, enabling all sizes to be held and cut to best advantage by selecting the appropriate hole. There is also an adjustable stop for quantity cutting. *Suggestion from the Board of Individual Awards, War Production Drive.*

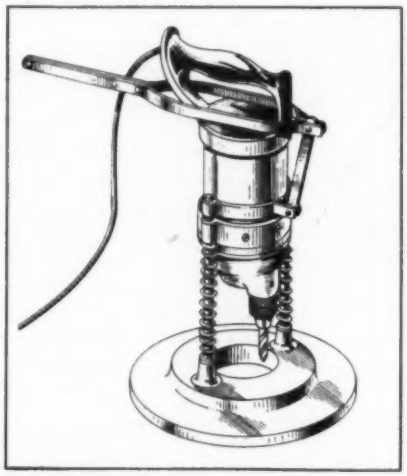


With cutter clamped to the bench, and a stop to measure the length of piece, bolts, rivets and rods are quickly and cleanly cut with ease

Lightweight Portable Stand for Hand Drill Promotes Accuracy

VIRGIL BURNS
Douglas Aircraft Co., Inc., Chicago

The two principal features of this attachment are its mobility, virtually making it a miniature radial drill, and its leverage arm, which greatly reduces the fatigue element.



Twin column stand reduces fatigue, saves time, and assures better work

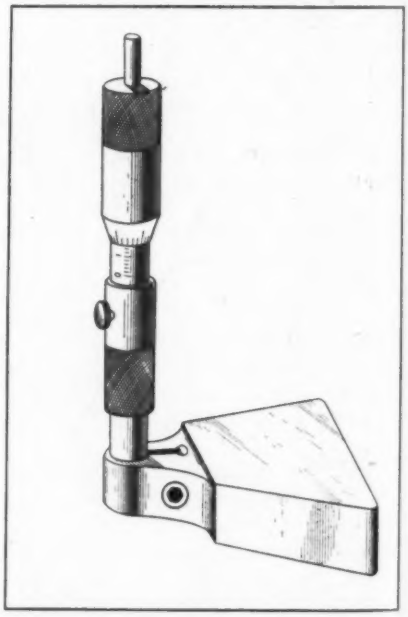
A collar with two bushings bored for the twin columns is fitted to the drill motor. Once the base and columns have been accurately assembled, the drill should slide vertically without wobble, without binding, and without friction or twisting tendency (due to the double supports). Two springs are selected which will slightly over-counterbalance the drill's weight, thus returning it after each cut without operator effort. For heavy drilling a stirrup has been added to the top of the columns with a link and lever, thereby greatly increasing the mechanical advantage. *Suggestion from the Board for Individual Awards, War Production Drive.*

Inside Micrometer Provided With Base for Height-Gaging Work

ROBERT S. ALEXANDER
Naval Torpedo Station, Newport, R. I.

In planer and shaper work, also in inspection work on the surface plate it is often necessary to obtain accurate height distances from the base of the work to some overhanging projection or hole in the casting. Usually a vernier height gage is used to get an accurate measurement or a set of gage blocks can be built up to the required height.

Not every shop has enough of these tools to go around. To overcome this difficulty I devised the base shown in the sketch to be used in conjunction with an inside micrometer that uses inserted spindles of varying lengths. The base is of machine steel ½ in. thick carefully ground on both sides to within 0.0001 in. I made mine triangular so that the hole drilled in the base to accommodate the anvil end of the micrometer would be at the apex in order to get close to the work to be checked or measured. Care should be taken that the hole drilled for the micrometer is square or at right angles with the base that the spindle is truly perpendicular. In checking the height of holes in finished work a plug gage is slipped in the hole and the micrometer set so that the top of the spindle just slides under the plug. In setting the mi-



Micrometer height and depth gage reaches holes and shoulders in confined locations

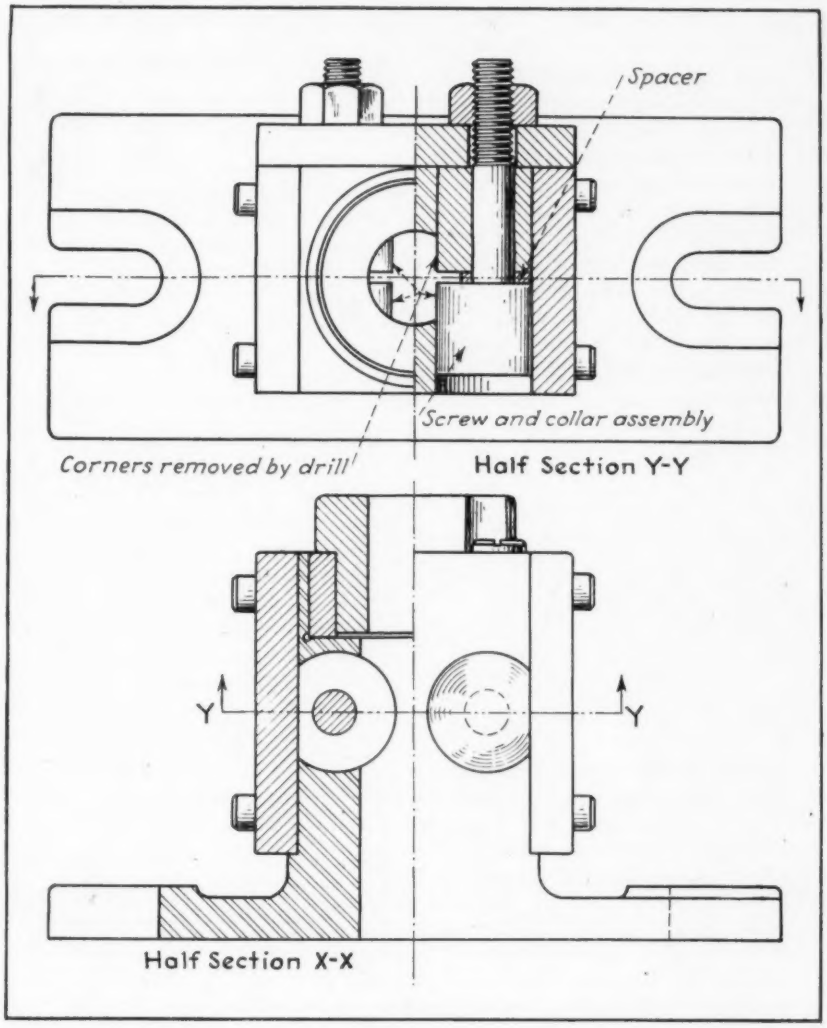
crometer in the base itself the vise is laid on a surface plate and the anvil end inserted in the hole until it touches the surface plate. The safety set screw is then tightened and the height gage is ready for use. When gaging from the top surface, subtract ½ in.

Drill Jig Eliminates Milling Operation

R. J. DeLUCIA

The finishing operation of a special screw and collar clamping device was the radius-cutting operation on one corner of each piece. Rather than mill these parts, a jig was developed to hold two screw and collar assemblies simultaneously. When the drill descends, it cuts the four corners at the same time without any side thrust or bending force on the tool or jig. Because of the nature of parts, this method was considered to be the most efficient, providing more accuracy and more production at less cost.

The base of the jig is cast iron, with two cross holes bored for the workpieces, a vertical hole bored to receive the drill bushing, and three sides milled for the steel side blocks. The drill bushing is held in place by a wide-headed screw and a notch in the bushing. The collar is slipped over the screw, held at correct distance by a spacer washer, and clamped with the nut outside.



By drilling the corners of four workpieces simultaneously, side thrust on both drill and jig is eliminated

Milling Machine Table Stops Advance Accurate Production

BY L. KASPER

Usually, the hand milling machine is used for short single cuts and is provided with an adjustable stop for this purpose. For production work, where greater accuracy is desired and more than one cut is to be made without disturbing the work, multiple stops must be provided for the milling table.

Four stud stops *A*, with locknuts, are set in the end of the table and the stop plate is attached to the saddle. The stop plate *C* is slotted large enough to permit the studs and their nuts to pass through freely. An angle stop *B* with an open slot just large enough to pass the stud, but will not permit passage of the nuts, is supported by the stop plate *C*.

To set the stops, the angle stop is placed over one of the studs, then the table with the workpiece is moved the correct amount and the locknuts set firmly against the angle stop. Each stud is set in turn.

In use, the angle stop is placed over a stop stud and the milling operation proceeded with until prevented by the nuts on the stop. Upon completion of a cut, the angle stop is moved to the next stop stud. In this way, four cuts of varying depth can be controlled in length by the position of the locknuts on the stop studs and the workpiece is not changed in its position on the milling-machine table.

With the stops accurately set for each operation, high production rates may be maintained with accuracy.

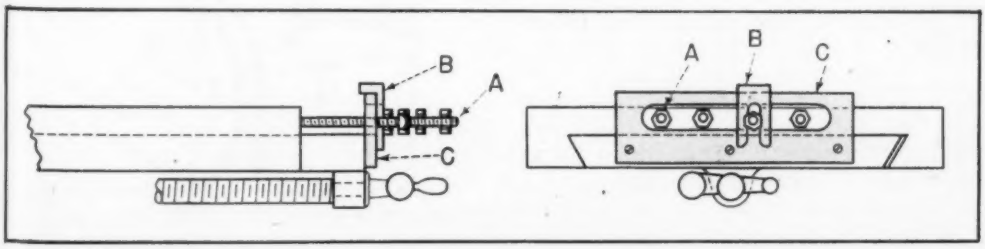
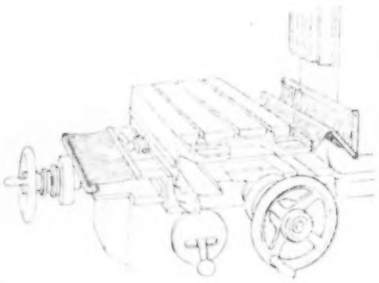
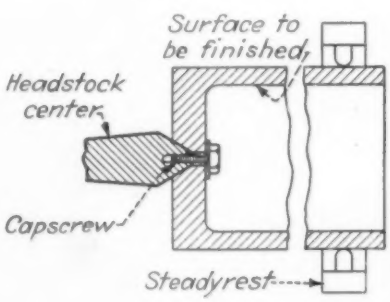


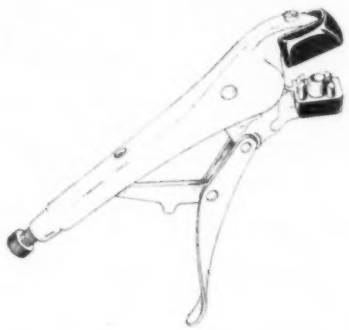
Table traverse is limited by locknuts on the stop studs which jam against an angle stop that is supported by the stop plate

Anti-Chip Protection—The illustration includes two types of composition covers which automatically protect the ways of this machine against chips, dust or abrasive particles without interfering in any way with the operation. The outer cover is a window-shade roller type and the inner has a lever arrangement with springs at the joints. *Henry O. Brown, Eastman Kodak Company.*

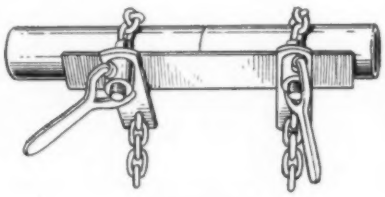


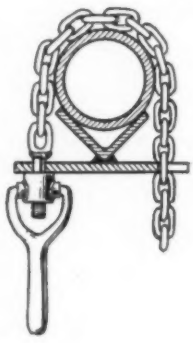
Center Holds Long Cylinders—The former method of holding an oleo cylinder for the internal grinding operation employed a center, faceplate and clamps, and a steadyrest to support the outer end. This proved unsuccessful because of the difficulty of setting up and the frequent deformations caused by the clamps. A standard center was then modified by removing the point and tapping it for a machine screw. In order to assure plenty of bearing surface to prevent slipping, the center hole in the workpiece was drilled much deeper than usual to take advantage of the full diameter of the center. This holding principle is equally adaptable to flat work which for any reason can't be held in step-collet, faceplate or chuck. *Charles F. Lucas, A. O. Smith Corporation.*





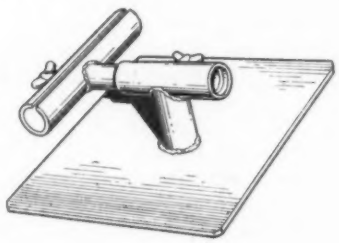
Portable Rivet Press—A pair of "Vise-Grip Pliers have been here adapted to install "Dot" fasteners without disturbing or moving the fabric. The standard punch has been brazed on, and a brass shoe fastened to the other jaw. In similar manner Vise-Grip pliers could be adapted to punching, riveting and installing grommets and snap fasteners, with possibly interchangeable dies. *Marion W. Wright, Naval Air Station, San Diego.*





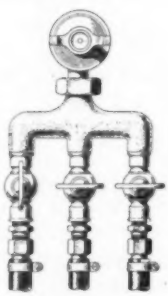
Alignment Clamp for Joining Pipes—Consisting of a short section of angle bar fitted with adjustable chains and screw tighteners, this pipe clamp grips both pieces securely and accurately without hiding the joint, until hangers or couplings are installed, or the ends tack-welded. *M. S. Kerr, Yard No. 4, Kaiser Cargo, Inc.*

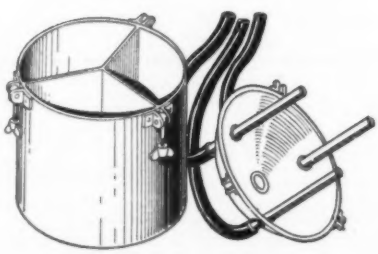
Pipe-Slitting Fixture — Broken hacksaw blades, wasted time and unsatisfactory results provoked the development of this vise. It clamps to the table of a horizontal bandsaw, and holds many sizes of pipe and tubing for the saw to cut longitudinally. *Alfred J. Fasula, Walsh-Kaiser Company, Inc.*

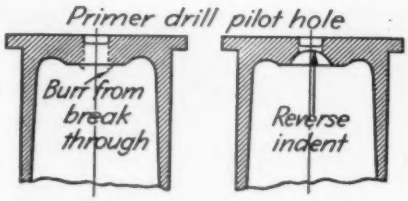


Multi-Color Spray Gun—Often a painter working alone on outside jobs has several colors to apply in small quantities—in stenciling signs for example—and he could greatly benefit by some quick-change arrangement.

This method uses a paint pot divided into three compartments with the hoses leading to a manifold (or a 3-way valve) on the gun. The change from one color to another is almost instantaneous, and blending of colors becomes possible as a byproduct of the idea. *Carlo DiCicco, Naval Drydocks, Hunter's Point.*







An internal indent in the heading operation leaves a clean, finished hole after drilling

Elimination of Burr Caused By Drill Breakthrough

H. J. GURNEY
Gotham Manufacturing Company

In the manufacture of artillery cartridge cases it is common practice to make an indent during the heading operation to guide the drill for the primer hole. When this drill penetrates to the inside of the case, a burr is thrown up which is difficult to remove because of the internal location.

To solve this, a cone-shaped button was added to the heading mandrel directly beneath the pilot hole indent. When the case is formed, another indent is produced on the inside directly opposite the outside one. The effect of this upon the drilling operation is to have the drill coming through to a surface almost tangent to the axis of the hole instead of directly at right angles, so the surface produced is clean, smooth, requiring no further finishing.

Universal Router Turntable Cuts Circles in Large Work

FRED MOLLE
Northrop Aircraft, Inc.

By employing the epicyclical rotation principle, circles, ellipses and elongated slots can be accurately cut without regard to the length of workpiece by using this pin-router attachment.

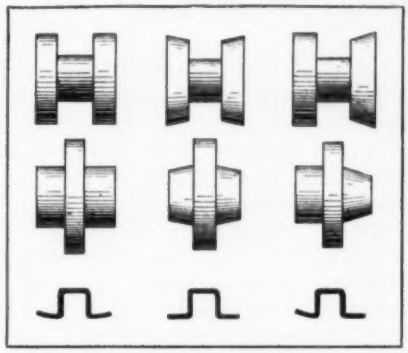
A pin is driven into the table of the machine directly under the cutter. A turntable is constructed which has two adjustable bars at right angles, one on top and the other on the bottom. The bottom bar has several holes, any one of which fits the pin on the machine table. The various holes in the bar plus the sliding feature permit *the center* of the turntable to be revolved at any radius up to 24-in. (the throat depth of the machine) from the cutter axis, making the turntable an adjustable disk-eccentric.

The indexing pin (for the work) on the upper bar can be moved away from the turntable center up to a 9-in. offset. Assuming that the turntable is revolving on its own center, and the upper bar is offset, the motion obtained will compare to that of the crankpin end of a locomotive connecting rod, as contrasted to the disk-eccentric. Any combination of the above motions, *with work always held in the same orientation*, will still produce circles, the radius of which will be the hypotenuse of the right triangle formed by the two pins and the turntable center. Ellipses can be produced only by tilting the table; arcs and scallops are made by alternating the two rotary motions, holding one element fixed.

Developing of Rolls for Forming Aluminum Hat Sections

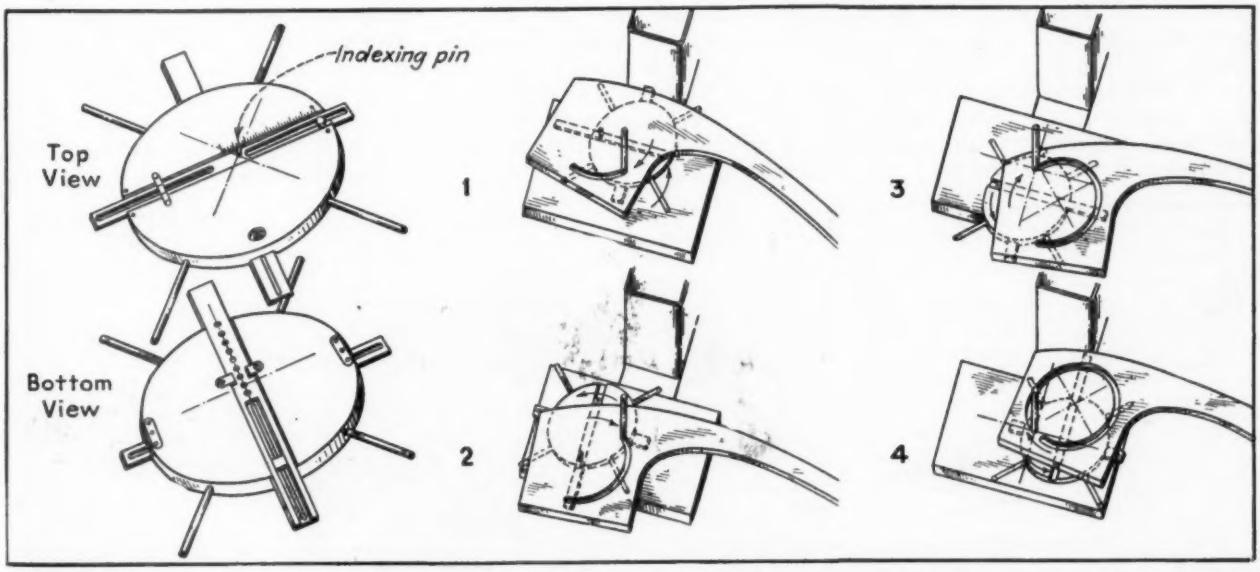
DAVID T. ARMSTRONG

An important piece of work required the rolling of hat sections in 4-ft. lengths on a sheet-metal forming machine. Three sets of finish rolls are shown in the illustration.



Because of the springback effect, roll shapes are modified to produce the desired hat sections

The first set with the straight ends produced a shape as shown beneath it, indicating that springback was



Steps 1 to 4 show successive phases of cutting a circle in a long piece of stock without rotating the work. The piece is grasped with both hands and moved in a counter-clockwise direction, causing the turntable to describe a counter-clockwise circle about the pivot in its lower bar

the difficulty. The next set, therefore, was made with the brim section of the rolls cut at a 10° angle, and these succeeded in producing square work. In one part of the job, a hat section with a tilted brim on one side was required, so the third set of rolls was made combining the knowledge gained on the previous experiments.

Although this description is simple, the actual experiments consumed considerable time, and it was felt that others might profit from this experience.

Height-Gage Extension Arm Reaches Difficult Places

D. E. McDONALD

The gaging of many parts is a difficult operation unless special devices are at hand. This is particularly true where small bores and shoulders are involved, when a check is to be made as to accuracy, concentricity and trueness. Frequently, various surfaces must be indicated in respect to a definite baseline, and such surfaces are hard to reach when the standard indicator is used in connection with a vernier height gage. An attachment designed for the height gage overcame the difficulties outlined above.

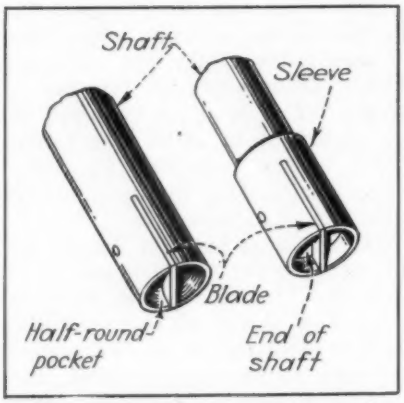
To the arm of the vernier height gage is fastened a slotted steel block. The sketch represents in section how the block clamps to the vernier and in turn holds the dial indicator and extension tube. A bellcrank wiggler screws onto the tube, and within the tube a 1/16-in. drill rod connects the dial button and wiggler. The rod is supported on three brass bushings equally spaced in the tube, and beveled to reduce friction.

Shield Makes Screwdriver Slip-Proof for Power Use

BY HAROLD W. DUNCAN
Goodyear Aircraft Corporation

Power screwdrivers were slipping out of round-head screws, tearing the screw heads and damaging the surrounding material. This trouble was eliminated by using a blade sheathed in a sleeve which covers the screw head so that the blade cannot slip out.

The two methods which can be used to make the screwdrivers are shown in the illustration. In the first method a recess to fit the screw head is drilled into the end of a shaft. A slot is cut to fit the blade and a small cross hole is drilled for the locking pin. In the second method, a sleeve is fitted over the end of the shaft which extends just enough to cover the screw head. Both blade and sleeve can be held in place with the same pin. *Suggestion from the Board for Individual Awards, War Production Drive.*



These power-driven screwdrivers do not slip off round-head screws because of the sleeve fitting

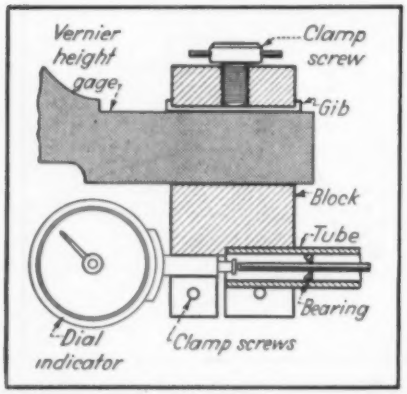
Boring tools are ground on the left face in the fixture section seen under the wheel; the right face is then ground in the other section

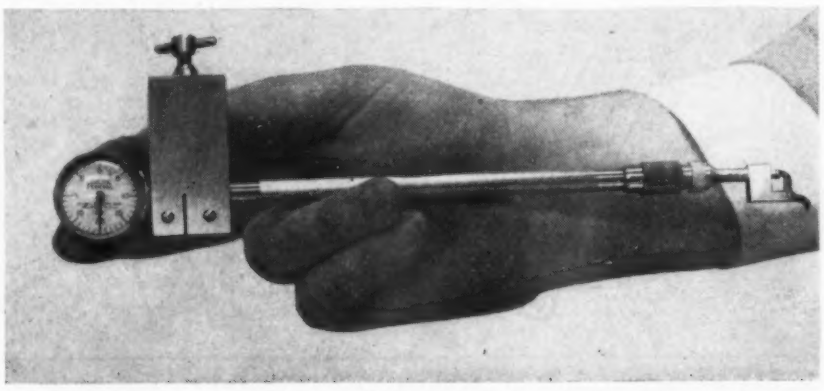
Fixture Holds Eight Tools For Multiple Grinding

BY CHARLES F. NAAS
Marine Engine Division,
Packard Motor Car Co.

Boring tools were formerly ground individually and checked against a gage to insure proper relation between the compound left and right angles.

The fixture illustrated has two sections, each of which holds four tools. Tools are positioned with the aid of a feeler gage, adjusting screws and a locating strap; after which they are locked in place with the screws opposite each tool. The left angle is completed first. The tools are then turned over and placed in the other section to grind the right angle. Locating from the already-ground left angle, the tools are advanced until they contact locating strap *A*, and locked. At the same time four more tools are placed in the first section so that one face on eight tools can be ground in one operation. *Suggestion from the Board for Individual Awards, War Production Drive.*





Block clamps to height gage and holds dial indicator and extension tube; measuring rod between dial button and wiggler (far right) is supported on three knife edges

Safe Use of Lifting Slings—I

HOW OFTEN have you seen lifting slings applied to loads in an ignorant or careless manner? For example, you may have stopped a graybeard from hooking a load with the legs of a double sling in almost a straight line; age or industrial experience are seemingly no guarantee that workers understand how the lifting capacity of a sling is affected by the angle of leg separation. But there are many other ways in which slings can be mishandled. Perhaps it would be a good idea to post a table of safe working loads for various kinds of sling materials and the following list of precautions in their use:

SLING PRECAUTIONS

NEVER:

1. Overload a sling.
2. Apply the load suddenly.
3. Insert a hook in chain link.
4. Carry the load on a hook point.
5. Use a sling that looks unsafe.
6. Hammer a sling hook into place.
7. Fasten a sling over sharp corners.
8. Cross, kink or twist a sling.
9. Let the load rest on a sling.
10. Drag a sling from under a load.
11. Trust a sling that has been stretched.
12. Carry an unbalanced load.

These precautions are not of much value unless slings have been chosen with a fair margin of safety for the jobs they are expected to handle. Material, durability, type, and size are important.

When lifting a load, give special consideration to the angle that the sling legs make to the horizontal, because lifting capacity decreases much more rapidly than might be expected as the angle is reduced. For each single leg or part at an angle of 60°, the lifting capacity is only 87% of that when it is vertical; at 45° it is 71% and at 30° it is only 50%.

For lightest loads, an endless fiber rope, looped into a noose about the object to be lifted, is satisfactory, inexpensive, light and easy to handle. Rope can be bent around comparatively sharp edges of boxes or crates, but should be padded where it passes over sharp edges of metal parts. Even on certain heavier jobs, such as handling shafts that must not be scratched, fiber-rope slings find favor. But on permanent installations and heavy lifting operations, fiber rope has limitations. One is deterioration through weather whereby it is difficult to estimate the actual strength.

Chain slings are open to additional objections. Most important is the fact that no chain, no matter how well made, is stronger than its weakest link. Chain must also be padded where it passes over sharp metal edges.

Roller chains, leather and cotton webbing are also used for slings to handle special jobs, but wire rope outweighs all other materials in common applications. Wire hoisting rope is usually of 6x19 construction, consisting of six strands each containing 19 wires twisted or 1 laid around a hemp-rope center. Failure of a single wire reduces the strength of the sling by only a small amount, but even so wire-rope slings should be handled carefully. Like rope and chain slings, they should be padded where bent over sharp edges of the object to be lifted. This is true even though the edge is of soft material, because the individual wires of the sling will be bent and highly stressed. For the same reason do not permit a wire-rope sling to kink.

The term sling includes a wide variety of designs. The simplest is the grommet or endless type, Fig. 1. When strain is taken on the sling, it crowds in and squeezes the load. To assure a firm grip, strike the bight that bears upon the hauling part with a 2x4 to make three 120° angles between components of the bight. These slings are also made with the bights

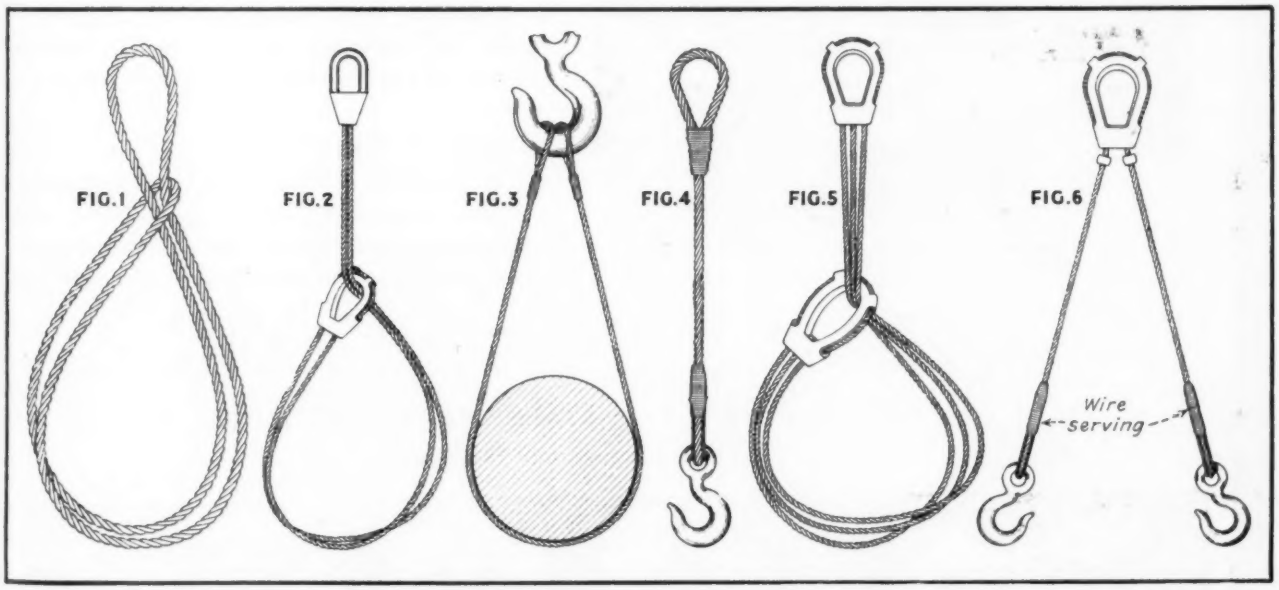


Fig. 1—The endless sling, usually formed into a noose, know as a choker or anchor hitch, is slipped around the object to be lifted, free bight being placed on crane hook. Fig. 2—Bights are sometimes threaded through drop-forged thimbles. Single-rope slings are made of spliced eyes. Fig. 3, or an eye and hook, Fig. 4. Equalizing thimbles, Fig. 5, permit making slings with several ropes in parallel or single sling with hooks, Fig. 6.

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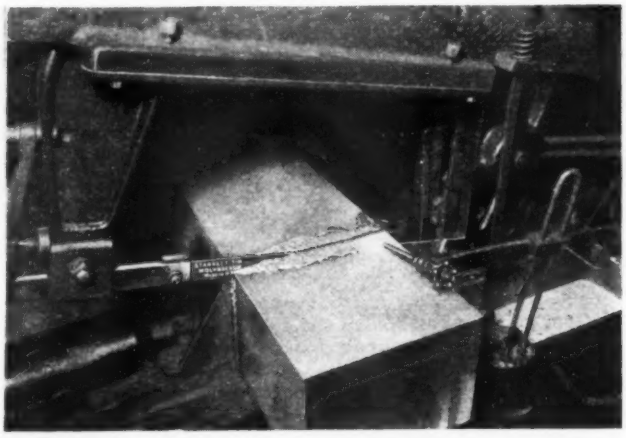

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Safe Use of Lifting Slings — II

threaded through drop-forged thimbles, Fig. 2, to reduce wear on the strands and bending the rope too sharply.

Another simple sling is the straight-rope type, Fig. 3, with a spliced eye at each end, either with or without thimbles. This type is almost always used in pairs to make the U or basket hitch shown.

Straight slings, Fig. 4, are made with a combination of rings, hooks, open or closed sockets at the ends. When used in pairs, they are: (1) attached to eyebolts or lugs on the object to be lifted; (2) attached to the crane hook to form a basket hitch, and (3) used to make a choker hitch. Straight slings need not be limited to one piece of rope—the cable may be arranged in two, three, four, five or even six parts by passing around equalizing thimbles at each end of the sling, Fig. 5.

For lifting loads such as large pipes, a two-leg bridle sling may be produced by using two straight slings shown in Fig. 4, or a single sling with hooks at the ends and an equalizing thimble at the middle, Fig. 6. For heavier loads, slings have three or four legs equipped with hooks or eyes according to the work, Fig 7. Because it is bad practice to pick up a load like a foundry flask on the point of a hook, special flat plates can be bent as shown in Fig. 7B.

For barrels or drums, it is customary to use a sling that has both ends attached to a crane hook by spliced eyes and a ring, and with two special bent-plate hooks floating on the bight, Fig. 8. Loads require a bar sling, Fig. 9, if they must be handled in a level position.

Hooks and forged eyes may be attached to sling cables by eye splicing, spelter or babbit socketing, or swaging as in Fig. 10. Slings should be made of plow-steel or improved plow-steel rope, and only by experienced splicers. Always wrap the splice with serving wire to cover and conceal sharp wires, which might cause injury and infection.

Much of the information in this article is reprinted from *Power*.

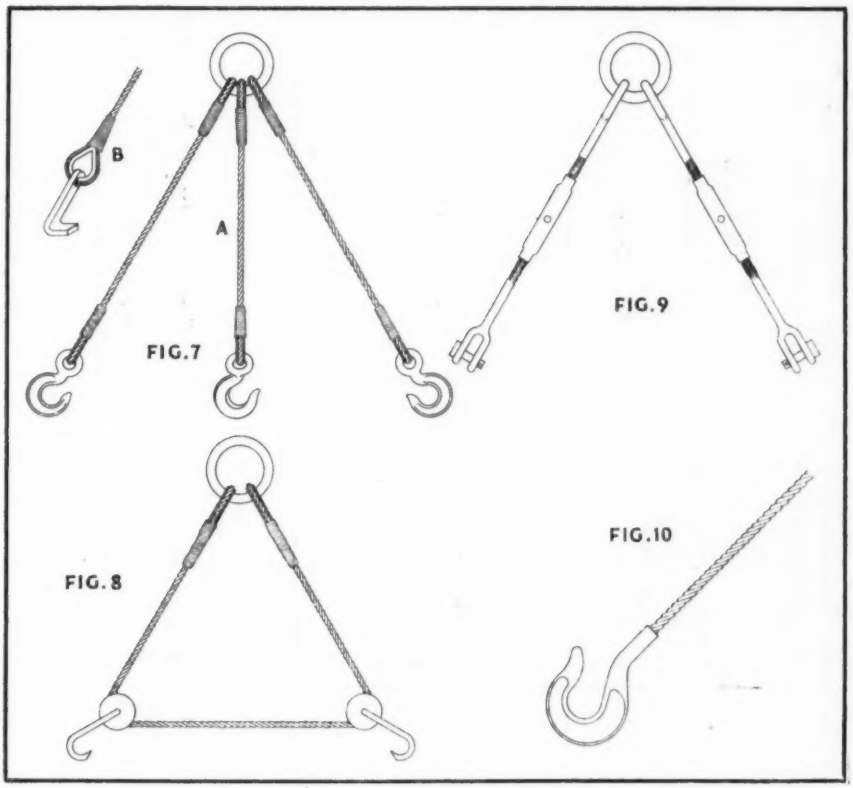

Fig. 7—For heavy loads 3- and 4-leg slings are fitted with hooks or eyes according to the object to be handled. Special plate hooks, Fig. 7B and 8, are used instead of picking the load up on the bill or point of a hook.

SAFE LOADS ON SLINGS IN TONS: FACTOR OF SAFETY IS 5

6 X 19 PLOW STEEL ROPE						IRON COIL CHAIN						8-PART BRAIDED SLING (ATLAS)					
Rope dia in.	Single leg Vertical	2-leg slings 60°	45°	30°	Basket hitch	Stock dia in.	Single leg Vertical	2-leg slings 60°	45°	30°	Basket hitch	Dia of rope used in.	Single leg Vertical	2-leg slings 60°	45°	30°	Basket hitch
3/8	1.20	2.08	1.70	1.20	1.70	3/8	0.90	1.56	1.28	0.90	1.28	1/8	0.77	1.34	1.10	0.77	1.10
1/2	2.05	3.55	2.90	2.05	2.90	1/2	1.50	2.60	2.14	1.50	2.14	3/16	1.71	2.96	2.42	1.71	2.42
5/8	3.15	5.46	4.45	3.15	4.45	5/8	2.31	4.02	3.28	2.31	3.28	1/4	3.25	5.63	4.60	3.25	4.60
3/4	4.50	7.79	6.36	4.50	6.36	3/4	3.38	5.88	4.80	3.38	4.80	5/16	5.04	8.73	7.13	5.04	7.13
7/8	5.67	9.82	8.02	5.67	8.02	7/8	4.67	8.12	6.64	4.67	6.64	3/8	7.06	12.23	9.98	7.06	9.98
1	7.39	12.80	10.45	7.39	10.45	1	6.20	10.80	8.80	6.20	8.80	7/16	9.41	16.30	13.31	9.41	13.31
1 1/8	8.18	14.17	11.57	8.18	11.57	1 1/8	7.80	13.58	11.08	7.80	11.08	1/2	12.10	20.96	17.11	12.10	17.11
1 1/4	10.09	17.48	14.27	10.09	14.27	1 1/4	9.60	16.70	13.62	9.60	13.62	9/16	15.12	26.19	21.38	15.12	21.38

Note: (1) Angles are between sling legs and horizontal. (2) for 3- and 4-leg slings, multiply 2-leg loads by 1½ and 2 respectively.

TOOL STEEL DATA

Revised data for Hot Work and Shock Resisting Die Steels including types, analyses, uses, hardening characteristics and temperature ranges

NOVEMBER, 1943

HOT WORK AND SHOCK RESISTING DIE STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES For Hot Work Dies and Tools, and Tools Subject to Severe Shock Requiring:	HARDENING CHARACTERISTICS	
				HARDENING TEMPERATURES	QUENCH RC
High Tungsten	FORMITE	C .35 Cr 4.00 W 13.50 Mo .40 V .35	• Highest Resistance to Heat • Long Wearing • High Strength	Range: 2150° F. to 2250° F.	Oil.....48-53 Air.....45-50
Chrome-Molybdenum	FIREDIE	C .35 Si .95 Cr 5.25 Mo 1.35 V .50	• Best Resistance to Fire Checking • High Shock Resistance • Air Hardening in Massive Sections	Range: 1800° F. to 1850° F. The total time allowed for preheating and holding at the hardening temperature should be at least 3 hrs. per inch of thickness.	Air.....50-55
Low Tungsten	BUSTER	C .60* Si .70 Cr 1.20 W 2.15 V .25 *other carbons available.	• Working Temperatures Up to 800° F. • Greatest Shock and Pressure Resistance.	Range: 1650° F. to 1750° F.	Oil.....50-60 Hardness depends on Carbon, Mass and Hardening Temperature.
TEMPERING:	For hot work the rule is: temper at as high a temperature as working conditions will allow. Double tempering of FORMITE and FIREDIE is recommended. FORMITE and FIREDIE are usually tempered between 1000° F. and 1300° F. For BUSTER the range is from 400° F. to 800° F.				

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NEWS OF METALWORKING

EUROPEAN TOOL MARKET

The first French Industrial Exhibition since 1938 held recently in Paris, was featured by the display of models of French, Swiss, and Belgian machine tools, some of which incorporated wartime developments. Most of them were actually old machines repainted to make a better appearance. However, none of these manufacturers exhibiting was in any position to produce tools in quantity at this time due to lack of materials and transportation.

No American tools were exhibited at this show. The reason for this, according to some observers on the spot, was that arrangements for the exhibition were rushed so fast that dealers handling American equipment could not prepare exhibits in time. However, British tools were well represented throughout the show, although some London firms reported that they were unable to exhibit because of such short notice.

ATOMIC ENERGY

The lack of appreciation of limitations on the ability to control atomic energy permanently was again demonstrated in a congressional committee hearing when someone suggested that atomic energy could be monopolized by the duPont combine, because of its extensive resources and its long work on atomic energy research. But little-known developments indicate that attempts to control the atom by controlling uranium are doomed to failure.

One reason is that duPont scientists are perfecting methods of refining thorium-bearing sands and developing methods of nuclear fission for the utilization of the atomic energy in the material. Thorium occurs in abundance all over the world in the form of complex salts. But duPont scientists are now acquiring extraction rights in remote parts of the globe.

GRAY IRON FOUNDRIES

Gray iron foundries are still beset by labor shortages, as they have been during the past few war years. Regarded a major wartime bottleneck early this year, the industry now finds itself regarded as a reconversion bottleneck to producers of automobiles, farm equipment, and household equipment.

W. L. Seelback, president, Gray Iron Founders Society, estimated the industry's backlog at 30,000,000 tons, as against estimated 1946 production of 10,000,000 tons. Castings prices are also said to be factor in the industries inability to lift output closer to estimated capacity of around 15,000,000 tons.

LEWIS CHIDES MURRAY

One high point of the Labor-Management conference in Washington was John L. Lewis' withering declaration to Phil Murray, president, CIO, that "there are more people in labor than are involved in motors and steel." Lewis made this remark in opposing Murray's proposal that the conference adopt a resolution stating that there was an "imperative" need for wage increases, that collective bargaining had broken down in many important situations, and calling on labor and industry to engage in "genuine" collective bargaining. Mr. Lewis said it was the business of the auto and steel unions to work their way out of their bargaining deadlock. He twitted Murray on recent CIO strike votes and asked if they were being taken "just for fun."

GERMAN DEVASTATION

Reports from Germany on relative devastation of German areas indicates that 80% of Frankfort, Stuttgart, Mannheim and Karlsruhe has been blasted: 100% of Kassel is in ruins, and if it were not a strategic center it probably would be better to rebuild the city on another spot. Hanover and Brunswick are in such bad shape that at least 50% of the cities will have to be rebuilt. Foreign correspondents in Berlin estimated that 60% of Berlin is in ruins, and that 80% of its industries were destroyed by bombing.

STRIKE BANS VOIDED

One more inadequacy of present labor laws and controls was revealed in the steel labor controversy, when major steel producers contended that unions could not take a strike vote when existing contracts prohibited strikes. NLRB could only say that it had no legal authority to disregard a union strike-vote request. The NLRB chairman said that of course it would much prefer not to take action that might result in a strike in violation of collective bargaining agreements.

NEW TRANSMISSIONS

Borg-Warner and Bendix both have automatic shifting auto transmissions under test at various motor car companies. Borg-Warner's automatic transmissions are made by Detroit Gear & Machine Division. It is rumored that B-W's transmission will be used in some of the Ford line next year, probably on a 1947 model.

REUTHER ASKS HELP

Detroit was astounded by Walter Reuther's (UAW-CIO vice-president) latest move in the union's "strategy" against General Motors, when the union appealed to the NLRB on the grounds that General Motors was indulging in unfair labor practices. The CIO had earlier boasted that its big guns would be trained on General Motors first, and that other companies would be later besieged one by one in military fashion.

First the UAW asked for a 30% wage increase, demanding that it be granted without any increase in auto prices. When General Motors refused, UAW took a strike vote giving its members the right to go out on strike whenever ordered to do so. General Motors proposed that the union join the company in asking the government for a 45-hour week during reconversion, so that wages would not be reduced. When the union flatly rejected this proposal, General Motors offered cost of living increases ranging from 5-8%. This was followed by Reuther's charge of "unfair labor practices on the part of G. M."

CHINESE ENGINE PLANS

Dr. Wellington Koo, high Chinese diplomatic official, is reported to be dickering for the Ranger Aircraft Division of Fairchild Engine & Airplane Corp. This move may tie in with reports that Chinese plan to adapt aircraft engines for use as prime movers. It is rumored that Dr. Koo plans to bring Chinese laborers and engineers here to work in the plant, which will eventually be moved to China.

SMALL HONES

Micromatic Hone is now making some small hones 3/16-in. in diameter with plastic binder to carry the grit. It is reported that they will finish holes to within 0.0003 in.

Gaging Business

Strike Loss Huge

It now begins to look as if the nation may suffer because of strikes an economic loss close to one billion dollars before the end of 1945. Through the end of October the loss had already approximated $500,000,000 and many incalculable strike ramifications were still hampering reconverting industries.

The CPA (WPB's successor) estimated that from July to October, the potential production of 53,604 cars had been lost, largely due to labor trouble, partly due to parts shortages. CPA reported that only 19,136 cars had been produced, as against the 72,740 cars earlier expected for the four month interval. However, the CPA figure makes no account for the production losses extending into November and December.

The Automobile Manufacturers Association went further and estimated that the production of 350,000 motor vehicles would be lost this year due to strikes and lack of parts from strike-bound suppliers' plants. AMA estimated the cost to the nation of this direct loss at $350,000,000, and figured that inability to use these vehicles would cost the country another $150,000,000 in unearned wages by truck drivers, and in gas, oil, and other materials that might have been used with these vehicles.

Other Costly Strikes

The loss in steel production due to the coal strike is set around 750,000 tons. Its effects upon durable goods industries cannot be measured, although it is known that production plans of most reconverting industries have had to be scaled downward due to reduced steel deliveries. This has backed up orders on steel mills and caused many steel producers to allocate their output to district offices' customers. The steel loss exceeds $40,000,000 in value at the steel mills alone, and a minimum loss equal to that amount was probably experienced in the plants of potential users due to lack of steel, inability to machine it, and the resultant loss in finished products.

The strike of machinists on the West Coast, and many other strikes throughout the country have also taken their toll in lost production and wages. Over-all, the nation's reconversion setback will take many months to overcome. But the wage loss can only be made up in part.

More Trouble Ahead

Despite the recent moderation in the wave of strikes nationally, there is more labor disturbance for industry in view unless effective federal action is taken. Strike votes have been taken in General Motors, Chrysler, and Ford, and requests for such votes in leading steel plants have been made to the NLRB.

Industry remains caught between labor's demand for higher wages and OPA's insistence of fixed prices at levels regarded by industry as inadequate to permit wage increases. The situation is further complicated by the circulation of various sets of figures purporting to prove that industry can afford to give a 30% raise, a 24% raise, a 10% raise, or whatever figure happens to result from the particular report.

Tool Plants Hit

Tool builders have been hit by strikes in foundries and in bearings plants, with the production of some builders now down to 50% of planned schedules. This complicates the industry's attempt to reduce its $200,000,000 backlog, and partly explains why recent monthly output dropped to around $28,000,000 as against earlier average levels of $40,000,000. Skilled labor shortages in some plants have also been restricting factors.

Although many new tool models have been introduced since the end of the war, it is reported that others are being held up due to the lack of engineering help.

Federal Tool Reserve

As had been expected, the government will keep some 100,000 of its 600,000 machine tools in its arsenals and as a war reserve. The Army-Navy air forces has just recommended a reserve of 49,947 machine tools to be held for any future emergency. Meanwhile, the government is expected to retain the 44,670 machine tools installed in its Army and Navy arsenals. It is likely that other reserves will be set up.

With respect to other items of production equipment, a reserve of 13,770 units for future air force use has been recommended. This is exclusive of the 23,400 units held in Army and Navy arsenals and ex-

However, the RFC's job of disposing of the remaining 500,000 tools continues as a very difficult surplus problem. It is expected that RFC will have to enlist the aid of tool dealers and manufacturers in the very near future. Tool builders may recondition some surplus items before sale, while dealers may be required to supplement efforts of the inadequate staffs at RFC's disposal offices.

New Midget Washing Machines—Menasco Manufacturing Co., Burbank, Cal., which has switched from airplane landing gear to washing machine prouction expects to have about 10,000 portable washers on the market by the year-end. These units, shown on the assembly line, weigh only 18 pounds and can handle small loads, but will be very low-priced

Gray Iron Castings Bottleneck Slows Reconverting Plants

CPA doubts seriousness of situation, but various industries report slowdowns and layoffs due to castings shortages. Labor lack blamed

WASHINGTON—Gray iron castings supply for automobiles is seriously short but capacity and deliveries are building up and the general alarm now in circulation is not justified, in the opinion of specialists in this field. Sources point out that auto production is still small and demands proportionately small deliveries of castings. The real trouble will come, they believe, when auto production approaches and passes the prewar rates.

Spokesmen said they are aware of some present tight casting situation in the auto field, but believe the general condition is not more serious than was to be expected.

New Customers Hard Hit

Manufacturers in the "miscellaneous" group are the hardest hit. Some of them cannot get castings at all; many cannot get all they need. As Washington gets this picture, one reason is that old, big customers are taking the deliveries, while new-comers wait. Manufacturers trying to launch entirely new lines or models of hard goods have the most trouble of all.

A major cause of the gray iron casting shortage is the placing of orders for stock-up quantities not immediately needed. Founders know what is going on and they often reject or pare down the orders, while most decline to accept them.

Auto Foundries Cut

Another cause of the tight situation is low production in the "captive" foundries (owned by auto makers). These were cut back to about 25% of capacity in 1941. Three were shut down completely, according to Washington sources. Chevrolet, Buick, Pontiac, Ford, Chrysler-Dodge, and Cadillac are among those said to have kept going. All are building up production, and their output will definitely improve within two months. It is estimated that the auto industry procured at least half its gray iron castings from outside sources before the war.

The industry all told is now producing at the rate of about 9,000,000 tons annually. This rate must be lifted to at least 12,000,000 tons to meet reconversion demands of automotive, refrigeration, farm machinery, household appliances. A rate of 19,000,000 tons has been hoped for, mostly by writers, but the industry never has exceeded 11,000,000 tons, according to J. D. Small, WPB (Now Civil Production Administration) chief of staff.

Getting More Labor

CPA and the United States Employment Service (the latter has absorbed the War Manpower Commission) is cooperating with the castings industry in an effort to attract workers to foundries by pointing out that the huge backlog of orders means steady jobs, with rapid upgrading from 87c to $1.20 per hour. The present backlog for automotive type castings, wanted urgently, is estimated at seven to eight months' production. Potential business would occupy the existing casting plant for four or five years. Some officials pointed out that the "automotive type" gray iron castings now in short supply are those used in cars and in other products like refrigerators, washing machines, sewing machines, farm tractors, etc.

They also suggest that persons discussing castings should define their terms. The gray iron industry comprises more than 2500 foundries both captive and commercial, and these are divided into seven or eight segments: ingot molds, chilled iron carwheels, brake shoes, pressure and soil pipe, automotive type, machine tool and machinery and general jobbing shops. Soil pipe is a special problem because production was almost completely shut down during the war; but production has gone up in ten months from 12,000 to 17,000 tons, a considerable improvement.

Working Conditions Vary

Officials of interested federal agencies, and of the industry, deplore rumors that all gray iron foundries are unpleasant to work in. This industry, they explain, is like any other: some plants have poor conditions but many have been modernized for worker convenience. Some have modern, labor saving machinery, and some have not.

It is difficult to compile classified statistics on castings, because some producers change from one thing to another—autos to lawn mowers to farm implements, etc. Sometimes a producer of castings does not know in what end products they are finally assembled.

Substitution of aluminum and magnesium for iron castings, too-freely predicted during the war, is very slight. In most items the difference in cost, roughly 10c against 40c, is not justified by the weight saving, and in many cases the light metals are not serviceable.

Machine Tool Builders, Others Hit By Gray Iron Shortage

CLEVELAND—The reconversion program and full postwar production on a thousand items ranging all the way from household appliances to automobiles and products for heavy industry have been slowed up to little more than a crawl by the rapidly developing acute shortage of gray iron castings. Not only are the machine tool builders and the automobile manufacturers feeling the pinch, but the builders of refrigerators, ironers, stoves and a whole host of other products are either curtailing their production or are operating on a hand-to-mouth existence, all because of lack of vitally needed gray iron castings.

Relief from the situation is not in sight as yet, say spokesmen for the gray iron founders.

Prices, Labor Blamed

Primarily the present shortage springs from two causes: labor, and the apparent lack of understanding on the part of price fixing agencies of government.

W. L. Seelbach, president of the Gray Iron Founders Society, Inc., sees about 10,000,000 tons of castings for this year. The industry has a potential output of between 14,000,000 and 15,000,000 tons. The 5,000,000 ton lag can be directly attributed to the two factors mentioned above.

With a backlog of approximately 30,000,000 tons, production should be at its highest peak, Seelbach claims, instead of lagging far behind as at the present time.

The problem of labor is the big fly in the ointment. Where the industry was expecting an end to their labor shortage, with the arrival of V-J Day, the industry now is confronted with the problem of keeping their shops operating with about the same labor they had before the shooting war ended.

No Price Relief

As for an upward revision in price of castings, the industry is looking with renewed hope toward Washington, since there are signs being shown that a more realistic consideration will be exhibited towards the industry's pleas for an increase in price.

Strikes Hamper Material Shipments to Tool Builders; Skilled Labor Short

CLEVELAND—Factors not taken into consideration and unforeseen 60 days ago are now making themselves felt to such a point that more than a few of the machine tool builders in the Cleveland area are failing to meet the quotas in new products they established for themselves soon after V-J Day.

Production in some of the shops has been reduced as much as 50 per cent due in a large part to strikebound plants which have been supplying them with castings, bearings and special items. In fact, in one of the larger machine tool building plants in Cleveland, fully half of the employees were being sent home daily because the foundry supplying castings was unable to make delivery of the needed material. The stoppage of material in this instance was not because there were any differences between management and labor in this particular foundry, but the foundrymen were on strike simply because a countywide strike had been called in a very small concern. Nevertheless, the strike served to seriously cripple a prime manufacturer in Cleveland many miles away.

Bearings Bottleneck

Scarcity of bearings because of strikebound plants was causing another manufacturer to curtail operations greatly within his plant. He notified his customers that delivery of his product scheduled for early November must now be revised and with no definite date being set as to when delivery could be made.

Machine tool builders are becoming increasingly concerned since they are fully aware of the probability of orders on their books being cancelled, and the customers turning to the stockpile or pool of the DPC or RFC for the needed tools.

No one as yet has been able to come up with an answer to the problem—if there is an answer. Inventories on castings, bearings, etc., have not been built up simply because such a procedure was impossible during, and in the short time since, the war. Scraping rock bottom now, many a machine tool builder is facing a complete shutdown within the next few weeks unless conditions are quickly alleviated.

Little Russian Business

While there are scattered and isolated instances where orders for machine tools have been placed direct for the Russians, the great bulk of the machines needed are still closely held in the vest pockets of the buying agents, evidently awaiting the outcome of the U.S.-Soviet negotiations for a loan from this country.

Orders which have been placed direct by the Russian agency to date have been on a cash basis and only after the Soviets have used all the pressure which could be brought to bear for price concessions. The real flood of orders for machine tools from this source is looked for once this government and the Soviet Union agree on the size and conditions of a loan to be made to the Russians.

New models of standard tools are slow in making their appearance, in many instances because of a shortage of competent engineers to do the necessary engineering and also because of the excessive costs facing the manufacturer today. Too, the shortage of competent labor is acting as a deterrent in some shops.

RFC Holds 10 Day Price Tag Sale of Surplus Machinery

DETROIT—The Reconstruction Finance Corp. inaugurated a new system of selling surplus war machinery Oct. 22 when it staged a "price tag" sale at the Kelsey-Hayes Wheel plant in Plymouth.

Over 1,000 pieces of machine tools and equipment were offered for sale f. o. b. at the plant, according to Arthur J. Fushman, Detroit manager of RFC. The sale continued 10 days.

Since the approximately $900,000,000 in machines, tools and raw materials, in Detroit area plants during the war, were placed on sale almost three months ago, over $325,000,000 worth have been sold, Fushman said.

Despite Handicaps, Vancouver Shipyards Seek French Orders

VANCOUVER, B. C.—Shipbuilding firms in Vancouver are now completing estimates to submit bids for the construction of ships for France, as a result of the development of new trade agreements between the Canadian and French governments. The Pacific coast shipyards expect the biggest competition for this business will be the bids from eastern shipyards. They believe that, despite eastern yards' advantages, western yards can arrive at a satisfactory understanding with labor to help off-set the disadvantage they are placed under through the long rail haul.

Chrysler Workers Okay Strike—At the expense of the government, the Chrysler workers overwhelming voted in favor of striking at the special election, shown here in progress. Meanwhile, organized labor and management representatives confer in Washington on ways and means to avoid labor strife, also at federal expense

Detroit Letter

Labor Peace Doubted

Strikes or enforced mediation appear to be in the offing on the industrial front here. Observers feel that strikes are inevitable, just when production is stepping up fast. They are frankly pessimistic that the controversy over a 30 percent wage increase right down the line can be settled peaceably.

The testing grounds are the negotiations between UAW-CIO and the General Motors Corp. So far they are stalemated and from recent indications, they will continue to be until the inevitable happens.

Reuther's Stand Opposed

Gist of the troubels appears to be Walter P. Reuther's insistence that wage increases not be reflected in higher auto prices. Equally insistent is the corporation's stand that the question of wages not be tied in with prices. That is strictly the corporation's province, both C. E. Wilson, president of GM, and Harry Anderson, vice-president in charge of labor relations, state flatly.

The issue was raised flatly when GM countered the UAW's demands with an offer to adjust wages to cost of living. It offered to raise the wages of employees by classifications which, since 1941, have not been increased in proportion to the increase in the cost of living.

Price Statement Puzzle

This amounted to an 8 to 10 per cent boost for the majority of the 180,000 hourly rated employees of the corporation. But Reuther rejected it flatly, charging that GM only made it in expectation of having it reflected in higher prices on 1946 cars. Just how this would make price increases and the 30 percent flat raise wouldn't, was not explained.

Reuther characterized it as a "bribe offer" to sandbag consumers. "This would be a short cut to inflation," he charged.

The UAY vice president assailed GM's failure to file cost data with the OPA, holding up prices on all cars. He pointed out that Ford, Studebaker, Packard and Hudson had submitted figures but not GM.

"This is a deliberate conspiracy to create a situation to get higher prices from OPA," he said. Reuther also rejected Wilson's proposal for a 45-hour week with premium pay after 45 hours.

48-Hour Week Rejected

"We're not going to turn the clock back," he stated. "If they think we are going to work a 48-hour week with millions of unemployed and service men returning, they are plain insane."

So far, Reuther has shown no disposition to modify his 30 percent demand. He said the Bureau of Labor Statistics report backed a 34 percent wage boost because the figures had been prepared last spring when the war was figured to go into 1946.

Car Output Rising

Meanwhile, the factories are working feverishly to turn out as many cars as possible before any strikes break out. Chevrolet presented its line, Mercury is in production and Plymouth is expected to announce its 1946 models soon.

Studebaker is slow in getting under way and Lincoln is getting set. But the rest are doubling production schedules this month and expect to do the same in December.

Supplies Troublesome

Some fear is felt for steel because of the coal shortages. Some suppliers are held back because of the wage disputes, fearing to quote prices because of the uncertainty of the outlook. General Motors blamed this uncertainty for their failure to get cost facts to OPA. One large truck supplier is said to have refused to deliver any more parts.

But in the main, production is increasing. Orders are being taken for Fords, Chevrolets, Buicks, Pontiacs and Packards. The latter displayed its Clipper line with much success. It is getting out about 50 a day now and expects to double this output.

More Branch Plants

Despite the bad outlook, the various companies are expanding their branch assembly plant setup. Ford has opened a half dozen units, the latest in Framingham, Mass. GM is doing the same, its latest being the leasing of the North American Aviation plant in Kansas City, Kans.

The corporation had expected to build a branch plant there but found the North American setup to its liking. It will assemble Buicks, Pontiacs and Olds cars.

The Ford Mercury will not only be made at Rouge but production is expected at the Chicago and Edgewater, N. J., plants. Mercury will be separated from Ford and will have its own dealer setup. New assembly points will be the Lincoln division and two new Lincoln plants, planned on the East and West Coasts.

February for Frazer

Kaiser-Frazer Corp.'s move to Willow Run from Graham-Paige was held up a few days by a dispute with the union when Graham cancelled its contract with the UAW local. This was settled and moving progressed.

Joseph Washington Frazer has promised that his medium priced car will be out by February and that the low-priced Kaiser will not be far behind.

Fisher Mystery

Rumors of impending changes of moment in the industry continue to float in and out. The Fisher Brothers are now being connected with a deal for Packard, with Charles E. Sorensen, late of Ford and now with Willys-Overland, somewheres in the picture.

The Fishers are still the mystery men of the industry. The Hudson negotiations appear to be definitely at an end as far as they are concerned. But few believe that the brothers will stay out of the automotive scene forever.

And Still They Come—Beset by strikes and labor troubles, the auto industry continues to introduce new cars, and get as much initial production turned out as possible. Here is the new 62 model Cadillac

New Orders Limited by Steel Mills; Flat-rolled Tonnage Allocated to Areas

PITTSBURGH—Some steel mills are beginning to clamp down on the acceptance of orders for first quarter delivery to hold them within limits which can be met by probable schedules. This factor, plus unsettlement over prices and wages, it is reported, accounted for the decline in new orders reported by mills in recent weeks.

Allocations of actual production is being tightly controlled by producers with margin of profit being an important determinant of the volume of various products turned out. Each selling district of major steel companies is being assigned a specific tonnage of sheet and strip for certain periods, and this is being split up among the consumers in each area.

Auto Stocks Low

The auto industry is just beginning to get some substantial tonnages of light flat-rolled material, and it has not been able to build up any substantial stocks. Steel industry's tonnage loss during the October coal strike prevented deliveries to auto makers from reaching expectations in that month.

Delivery promises vary widely in steel bars, but comparatively early deliveries are available on plate. Mills are favoring small shapes over large sizes and production of concrete bars is relatively small. Demand for wire and pipe continues strong.

Prices A Handicap

Mills are trying to protect themselves against taking too many orders at current prices, whereas consumers are trying to buy all they can since they know that mill prices can go no lower, but may be higher. OPA price increases have been overlong delayed with the industry stating that it will not grant wage increases until higher prices are announced.

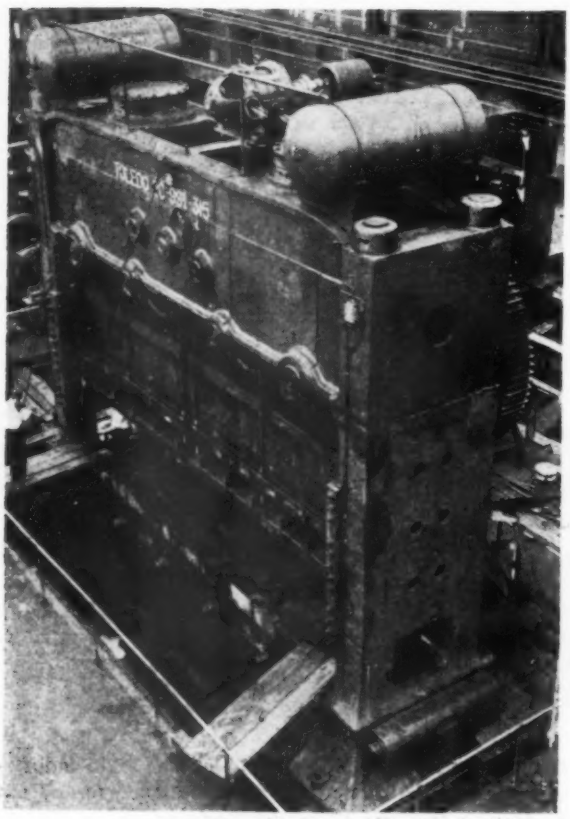
Some small recovery from the recent coal strikes has been made, and some mills actually have built up additions to depleted coal stocks. But adequate stocks to assure continuous operations at higher levels are not yet at hand. Operations are being held at current low levels also because of manpower shortages, particularly in primary steel departments.

Although the labor situation continues to be the key to future steel operations, there is still no indication as to how current differences will be ironed out. CIO would like industry-wide collective bargaining, but some observers hold that this would be impractical because of the varying economic conditions that face individual companies.

The war-intended steel inventory picture is being cleaned up fast. This material has gone two ways—producing mills have taken the major part for use in their own finishing operations and thereby relieved the government of a termination claim. There is also a fair amount which is being publicly offered as termination inventory.

Surplus Inventories

It is understood that scrap dealers or those who specialize in odd-sizes and odd-amounts are the chief bidders for this material. They are mostly bidding scrap prices and Army requirements are that realization must be higher. Result is, in many cases, the material is turned over to Ordnance Department for disposal. Navy is offering expensive alloy steels for sale on a bid basis.



For Russia's Automotive Industry—One of the largest ever built, this giant rail press, weighing 625 tons, was produced by E. W. Bliss Co., Brooklyn, N. Y., for use in Russia's auto industry. Bed area is 80" by 315", and can accommodate two sets of the same die to produce two chassis frames every ten seconds. The unit was dismantled for shipment. Present status of Russian tool and equipment business in this country is uncertain, pending new financial arrangements with the U. S.

Pig Iron Price Raised

WASHINGTON—O.P.A. granted an increase of 75 cents per gross ton in the maximum price for pig iron, effective Oct. 23. This second increase since the original ceiling was set in 1941 was necessary to permit the industry to obtain the rate of return required by O.P.A.'s over-all earnings standard, the agency said.

Ohio Firm Instigates Profit Sharing Plan for Empoyees

CUYAHOGA FALLS, OHIO—The inauguration of an annual profit-sharing plan was recently announced for the employees of the Falls Engineering & Machine Co. Starting next month surplus earnings of the company will be distributed among all employees according to a unit system, based on the worker's present compensation and his length of service. Officers of the firm said the new plan will replace a bonus arrangement now in effect.

New ASM Officers

CLEVELAND — Dr. Charles H. Herty, Jr., assistant vice-president, Bethlehem Steel Co., has been elected president of the American Society for Metals. Other officers elected at the recent annual meeting include: vice-president, A. L. Boegehold, head of metallurgy department, Research Laboratories Division, General Motors Corp.; treasurer, Dr. H. K. Work, manager of research and development, Jones & Laughlin Steel Corp.; trustees, John Chipman, professor of metallurgy at Massachusetts Institute of Technology, and W. E. Jominy, chief metallurgist, Dodge Chicago Plant, Chrysler Corp.

AMA Production Conference Discusses Restoring of Prewar Cost Control

CHICAGO—Restoring prewar efficiency and cost control was the keynote of speeches and discussions at the American Management Association's Production Conference, held at the Palmer House, Chicago, October 29-30. Some 900 production executives noted this persistent warning by leading speakers who pointed out that the need for speed and large output at any cost during the war had actually impaired industrial efficiency, whereas the return of peace made cost control urgent. Many practical suggestions were proposed for reducing costs and improving labor efficiency with the aid and cooperation of workers.

Labor's lack of appreciation of management's problems was hit by L. Clayton Hill, works manager, Eagle Pencil Co., who stated, "They are pretty definite about what they want but they do not seem too concerned about where or how management can get it. The least we might expect of labor is a willingness to recognize that there are fundamental difficulties to be overcome when prices remain static while wages are jumped 15-30%." He expressed the opinion that one of industry's important losses during the war was a lowering of employee morale.

Foremen's Status Important

Any company that has a foremen's union or is threatened with one should review and analyze its stewardship was the opinion expressed by J. Keith Louden, production manager, Armstrong Cork Co., in his talk, "What's New in Production and Management Engineering?" He said that the foremen's desire to unionize stemmed from their feelings on job security, salary or responsibility. Management was at fault on these points if: (a) it allowed foremen's salaries to increase only after hourly workers received negotiated raises; (b) it failed to assure the foremen on the security of their positions; and (c) it did not support foremen on union matters, did not give them adequate help and facilities, and actually excluded them from policy-making activities. Mr. Louden said that management's wartime appeasement of labor should end and a firm stand be taken for the good of all.

Also commenting on the recent unionizing of foremen, W. J. Wemple, controller, R. G. LeTourneau, Inc., blamed lack of adequate wage differentials between foremen and the employees under them as a major reason for this trend. He urged that special incentives for supervisors be adopted as one means of overcoming this, pointing out that it would also lead to cost reductions.

Over-all Work Standard

The possibility of establishing a national and international "Standard Day's Work" was raised by Ralph M. Barnes, professor of industrial engineering, University of Iowa. Mr. Barnes stated that unless management gives the worker some idea of what is the normal output for his job, then the worker will devise some method of his own to determine a fair day's work. He said such standards should be set in all plants.

Simplicity in wage incentive plans was asked by Joseph N. Scanlon, Director of production engineering, United Steel Workers of America, CIO, who said that most of the wage incentive plans sent into headquarters for review and analysis were hopelessly confusing to workers and as a result could not possibly achieve cost reduction. He felt that most workers regard wage incentive plans and technological improvements as ways to put themselves out of jobs. Mr. Scanlon added that a good way to overcome this would be for management to work with unions, and cited instances where his union helped cooperating managements to reduce costs. He said that unless management engineers develop means of describing their operations to workers simply, they will bring their profession into disrepute and heighten the animosity of workers.

Quality Control

Quality control by statistical methods was declared to be one of the best means of watching costs and maintaining efficiency, in a talk by J. M. Ballowe, quality inspection department, Chicago Mail Order Co. He illustrated how statistical records could tell you immediately when corrective steps should be taken and in what way.

Material Handling Costs

Management should give more attention to material handling and plant layout in cost control, according to R. W. Mallick, section engineer, Westinghouse Electric & Manufacturing Co. Mr. Mallick reported that some 35% of industrial accidents are the result of poor plant layout and deficiencies in material handling. Since studies show that a unit of material gets from 20 to 150 handlings while in process of production, and industry spent about five billions annually prewar to handle materials, the cost of this factor bulks large. He said that no plant is better than its layout.

W. L. McGrath, president, The Williamson Heater Co., made a report based upon joint discussions of his supervisory workers. Citing that industry must regain cost control again, the report declared that such control is impossible without the full backing of supervisory forces. Mr. McGrath stated, "Insofar as some labor leaders oppose the philosophy of maximum production, they are defeating their own purposes and threatening the whole principle of employment continuity."

Telling the Workers

Management should explain more of its operating problems and difficulties to labor, if it wishes to gain greater support from its employees, was the major point of the speech by Paul Wishart, general plant manager, Minneapolis-Honeywell Regulator Co. He pointed out how special group discussions begun by the company to explain various management and operating phases to employees had worked out very successfully. It heightened employees' interest in the company and how it operates. At the same time, these programs gave the company many opportunities to emphasize the importance of reducing costs.

SURPLUS PLANE ENGINES MAY BE USED AS POWER PLANTS

WASHINGTON—One use for the thousands of surplus aircraft engines owned by the government may be in pumping, electric power and other stationary installations needed in China. RFC spokesmen say that this is only one of many such proposals. They add that many types of stationary power plants, more suitable and economical, are being declared surplus.

FIVE MILLION CARS SHORT

NEW YORK—There are five million cars less in use today than there were on July 1, 1941, according to registration data reported by R. L. Polk & Co On July 1, 1941, there were 27,700,011 passenger cars registered, but it is estimated that there are 5,227,000 fewer cars in use today.

Junking of cars in recent years has averaged 3,365 daily, and it is believed that the current rate is higher. Except for a few 1946 models, all cars in use have been in the hands of drivers for over 3¾ years, and more than one-third of the total autos in use are over 7½ years old.

Prospects of German Foreign Trade

by William J. Hargest

American Machinist European Correspondent

LONDON—With only a small amount of foreign trade outside of the military goods traffic needed for military projects and occupational aims, Germany is today, to a large extent, sealed off commercially from the rest of Europe and the world. That is the conclusion of officers of the Trade and Commerce Section of the Office of Military Government (U. S. Zone, U. S. Forces, European Theatre).

German governmental agencies, private firms, and individuals are strictly prohibited from negotiating or engaging in foreign trade transactions with foreigners without specific Military Government approval, foreign trade experts said.

Under the provision of Allied policy and the Potsdam Agreement, imports into Germany are limited to military supplies and to those civilian supplies without which occupational aims would be endangered by resulting diseases and disorder.

Exports from Germany are limited to those necessary to pay for the imports, to military supplies for the direct use or consumption of the Allied military forces, and to those commodities required by liberated countries, the lack of which would affect such military operations as the redeployment of troops and the occupation of Germany, or which endangers the minimum basic economy of the liberated countries.

Trade Limitations

Foreign trade with countries other than the United Nations is prohibited. However, exceptions have been made to this restriction. For example, soda ash is now being procured from Austria in exchange for certain other commodities. Soda ash is necessary in the manufacture of glass, a critical item in the U. S. Zone that is sorely needed to prevent diseases during the coming winter.

Requests for exports from the U. S. Zone in Germany are reviewed thoroughly to determine whether the commodity is essential for the minimum economy of the importing nation and whether the commodity is surplus to the minimum requirements of the German economy.

Payment for commodities exported has not yet been settled. The relatively small number of exports made so far have been mostly on the basis of barter or as charges against reparations.

Continuous survey of conditions along those stretches of German international frontiers under U. S. jurisdiction fails to indicate any large-scale illegal trading with foreign nations. While smuggling exists, it has not yet assumed the proportions of a major problem, trade and commerce officers concluded.

American Magnesium Corp. Closes Cleveland Plants

CLEVELAND—The two Cleveland plants of the American Magnesium Corp., wholly owned subsidiary of the Aluminum Co. of America have been closed with all work being shifted to the larger Buffalo, N. Y. plant. One of the Cleveland plants will be utilized by the Aluminum Company for its permanent mold casting department, but no announcement has been made as to the final disposition of the smaller one.

Officers and headquarters of American Magnesium Corp. will remain in Cleveland.

63,717 Machines Recommended as Army-Navy Air Forces Reserve

WASHINGTON—A joint Army-Navy air forces reserve of production equipment, including 49,947 machine tools and 13,770 secondary metal forming and cutting machines, totaling 63,717, has been recommended to the new Interdepartmental Air Coordinating Committee (War, Navy, State, Commerce Departments, and CAB) subcommittee. insofar as possible, selection of the equipment will be from that owned by Army and Navy; title would be transferred on items from DPC. Breakdown of the proposed reserve is as follows:

Machine tools	
Boring	1488
Precision boring	953
Broaching	368
Drilling	12,224
Gear cutting	1479
Grinding	12,632
Turning	10,100
Milling	6049
Planers	57
Miscellaneous	4597
Forming and Cutting	
Bending machines	2095
Hydraulic presses	886
Mechanical presses	2227
Shearing and punching	2350
Forging machines	651
Wire forming machines	157
Manual presses	1617
Welders, electric	3404
Welders, gas	118
Miscellaneous	265

The machine tool reserve is calculated to (1) supplement the volume of machine tools in use at the time of emergency; (2) permit the industry to concentrate on special-purpose tools; (3) provide flexibility in capacity by anticipating shortages in individual types; (4) give mobility of machine tool resources by shift from plant to plant.

The report also recommends that Army and Navy take title of DPC aircraft plants as follows: Columbus, Ohio; Dallas; Louisville, Ky.; St. Louis; Wichita; Chicago; Indianapolis; Kansas City; Lockland, Ohio; Melrose Park, Ill.; South Bend—and keep title to the following, which are already owned by the Army: Fort Worth; Kansas City; Marietta, Georgia; Omaha; and Tulsa.

Plane Production Estimates

Elaborate estimates of airplane production in a future typical year, broken down into transport, military, and private; estimates of engine production; total aviation employment; and regional data, are presented. Storage of reserve machine tools is briefly discussed. The 52-page document is must reading for metal-working concerns of broad interests.

Cincinnati Milling Subsidiary Formed; Romain Heads New Firm

CINCINNATI—Incorporation papers were filed in Columbus Nov. 5 for a new Cincinnati concern, Cincinnati Lathe & Tool Co., with an authorized capital of $100,000. The new company has acquired the trade name of The Cincinnati Lathe & Tool Co., Oakley, Ohio, as well as its land, buildings, machinery, designs, inventories and unfilled orders.

The new officers of the company, Millard Romain, president, and E. W. Mueller, secretary-treasurer, will operate the concern entirely independent of its parent concern, The Cincinnati Milling Machine Co.

The property of the Oakley concern is adjacent to that of The Cincinnati Milling Machine Co. and The Factory Power Co. Manufacture of "Cintilathes" in sizes from 14" to 32" will be continued by the new management.

Washington Bulletin

Labor Conference Opened

The most important domestic conference of this era got under way in the Capital with 72 of the nation's leaders of labor and industry participating. The President opened the session with a warning that the public does not like the let-down in production, after promises by these leaders that they would cooperate with the government in reconversion, and he predicted that the people will find a way to get production if the leaders do not. He meant that Government controls would be imposed.

Mr. Truman called upon the conference to settle its difference without stoppages, and if collective bargaining fails, to resort to some kind of impartial fact-finding machinery. Inquiries at the Civilian Production Administration (WPB) and the Office of War Reconversion, revealed no available data on the total effect of strikes thus far, in dollars or other measure of production.

Unified Service Aspects

If the Army-Navy-Air Forces merger goes through, as now seems likely, procurement agencies undoubtedly will be consolidated and contracting for ships, aircraft, weapons, and supplies will be greatly simplified for both the government and manufacturers. Much similar equipment used by the three branches will be standardized for the three, such as training planes, boats, trucks and a long list of supplies and small items. On the other hand, a great deal of duplication in administration, engineering, research, enlistment promotion, etc., will be eliminated. Proposals before Congress, strongly favored by Army, Air Force, and some Naval front commanders, would create a Department of Defense, headed by a Secretary of Armed Forces, under him a Chief of Staff of the Armed Forces, and under him chiefs of staff for Army, Navy and Air Forces.

Metals Still Tight

Items still in short supply for reconversion include mostly metals, particularly tin, lead, antimony, some graphites, transparent mica, corundum. Nobody seems rash enough to ask for uranium these days. Leading item on the components list is gray iron castings of the automotive type, meaning those for cars and for domestic hard goods, farm implements, etc. Pressure and soil piping are very tight, and holding up construction, but are rapidly improving. Malleable iron castings are short, too, but this type of production was not cut down as much during the war—it was merely changed to different products, and is not as badly off as are gray iron items.

Incidentally, almost all U. S. metals resources have been depleted to the point where some would not be sufficient to fight another war. Some will run out for civilian purposes in the next generation. Already, even in the heat of reconversion, voices of warning are being raised. When and if life in the U. S. settles back to normal, Congress is expected to look into this matter, and the scrapping of metal war gear will be reviewed. The high cost of salvaging metals which may be out of commerce in future, could begin to look like a bargain.

Holding Foreign Patents

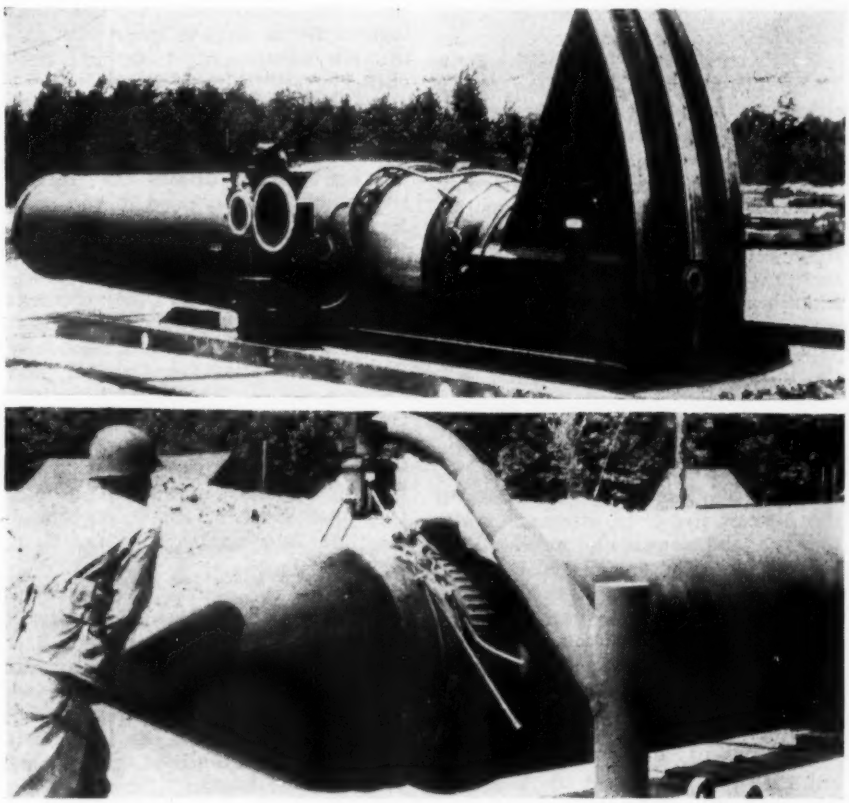
The Alien Property Custodian has told Congress that laws should be passed preventing the return of war-seized patents to foreign owners. A total of 33,000 enemy patents were confiscated by the Custodian, who has issued 1700 licenses for the use of over 10,000 patients.

Howland H. Sargeant, Custodian patent chief, told the Senate Military-Commerce subcommittee, which is hearing testimony on bills that would create a National Science Foundation, that reconversion would be seriously slowed if the enemy patents were returned to their owners. After the other world war, enemy patent owners filed claims in U. S. courts.

Office of Publications says that on November 16, 377 papers on German industry were started in circulation to American industry. Fifteen thousand copies of the index to these documents have been mailed, and interested persons can order them by mail, Commerce Building, Washington. Also soon available will be 344 reports on I. G. Farben, mostly chemical, and a 14-volume history of the Farben organization.

Atom Control Difficult

Total confusion are the only words that can describe the government's effort to deal with the atomic bomb and energy problem. New factors in the picture are: scientists who had all of the "secret" were so numerous and now so scattered that most foreign countries already have the formula, or will have it very soon. Now policy-makers hear of possibility there is not enough source material in the world to fight atomic wars with, anyway.



Too Late For The Japs—This 36-inch mortar was designed for use against the Japs. Built by Mesta Machine Co., the weapon fires a two-ton missile. In upper view the gun is at zero elevation

I.M.S. Time and Motion Study Clinic Poses Management Engineering Hints

CHICAGO—More than 1,100 industrial management engineers, time and motion study engineers and plant executives attended the ninth National Time and Motion Study Clinic held at the Continental Hotel on November 1 and 2. Sponsored by the Industrial Management Society of Chicago, this two-day meeting included discussions of such subjects as job evaluation, work simplification, the development of standard time data from stop-watch readings, the development of motion time standards and how operation time values can be set when using such standards, the determination of fatigue and other allowances, the correlation of process analyses and plant layout, and the attitude of both management and labor unions toward industrial engineering functions.

Costs Important

Of especial interest was a talk by P. K. Povlsen, vice president in charge of manufacturing, J. I. Case Company, on the responsibilities of the industrial engineering department in a modern industrial organization. He pointed out that a manufacturing industry is dependent for its success upon two groups of people. The first group includes engineers and research workers who are responsible for the development and improvement of products which the organization can manufacture and sell at a profit. The second group includes the industrial engineering organization, or rates and methods men, who are responsible for the cost of the product, since they determine the equipment and methods to be employed in its manufacture, the time allowances to be set on each operation, and the analysis of manufacturing operations in the interest of cost reduction.

Mr. Povlsen pointed out that in a competitive market everyone in the plant must be interested in costs and in cost reduction. He reminded his listeners that one of the biggest losses in manufacturing today is the pegging of production, especially by labor unions. He said that the answer to this problem lies in the education of management, supervisors, labor unions and producton workers so that they will understand that their success lies in the production of the largest possible amount of goods at the lowest possible cost. He also pointed out that people do not work solely for money and that management must take a real interest in the people making up their organization so that these men and women will have confidence in management and will take an interest in the success of the organization.

Progressive Labor Aspect

Of equal interest to those attending the clinic was a discussion on the subject of "Production with Freedom" by Edward T. Cheyfitz, national chairman of the C. I. O. Casting Division. Mr. Cheyfitz said that we need a national code of conduct under which labor unions and management can work together. He pointed out that if we are to develop a national code of conduct in industrial relations, we must have production with freedom for the worker and, at the same time, industry must produce at a profit with ever increasing efficiency.

Mr. Cheyfitz said that management's right to manage must be recognized, and that management must retain the right to make decisions and to maintain leadership in the plant. Labor must accept that right, but labor's right to organize must not be questioned. He also pointed out that both labor and management must work for increasing productivity. Management must eliminate waste and labor must accept technological advances, including improved management techniques as well as improved production equipment, tools and machinery.

Mr. Cheyfitz said that he approved incentives for production work, but pointed out that the average worker knows that incentives have been abused in the past. He said that we can go a long way toward the establishment of industrial peace if the improved techniques instituted by management work well for both labor and management, and can be understood by the workers. They are wrong if good for one side and bad for the other. He urged creative cooperation between scientific management and the production worker, pointing out that we must abolish human frictional losses if free enterprise is to be maintained.

Oberg Discusses Training

The fundamentals of a good methods training program was discussed in a paper presented by Mr. H. V. Oberg, industrial engineer, Armstrong Cork Company. He brought out some of the important features and methods of the training programs he has used in educating new people for time and methods work.

The rating of operator performance was discussed by Ralph M. Barnes, professor of industrial engineering, University of Iowa. Professor Barnes has been conducting intensive work measurement studies and reviewed some of the work now being done in industry to improve effort rating.

Methods of determining fatigue and other allowances were discussed by F. H. Bellows of Methods Engineering Council. He pointed out that a thorough and uniform job must be done in determining allowances, because of their effect on employee morale and upon manufacturing costs. All too often, allowances are established in an arbitrary manner without thorough analysis of the facts. He suggested the desirability of making all-day time studies in determining allowance factors. Often, such studies bring to light possibilities of improving methods which more than pay for the cost of the studies.

Plant Layout Problems

Lee S. Whitson, supervisor industrial engineering, Minnesota Mining & Manufacturing Company, discussed the correlation of process analyses with plant layout when setting up a new plant or arranging for the change-over of an old plant. William Gomberg, director, management engineering department, International Ladies Garment Workers Union, A. F. L., spoke on union's attitude toward management engineering.

The development of standard time data from stop-watch data was discussed by W. J. Biehl, partner, Fry-Lawson Company while the use of motion time standards were discussed by F. S. Buese of E. J. Brach & Sons and by Robert MacLatchie, industrial consultant. Wage incentives established from motion time standards are gaining in popularity, especially where the work is repetitive. It is claimed that time allowances set from such standards generally are more accurately set and provides for consistent earnings than do allowances set by other methods.

Various phases of job evaluation were discussed by Eugene Berg of the Link Belt Company, R. H. Landes of the Western Electric Company, and P. H. Weber, of the Business Research Corporation.

Eastern Concern Buys Radiart

CLEVELAND—Maguire Industries, Inc., Bridgeport, Conn. and New York, has purchased the three Cleveland plants of Radiart Corp. and will operate them as 100% owned subsidiaries. Leslie K. Wildberg, president of Radiart, said the company makes vibrators, auto radio antennas, power units and electronic materials.

Names in the News

C. L. Jacobson

Harry W. Bennett

Charles L. Jacobson, who has been in charge of Chrysler's war activities in its Evansville, Ind. plant, has been appointed assistant to the general manager of subsidiary operations for Chrysler Corp. A member of the Chrysler organization since 1925, Mr. Jacobson was named general sales manager of the sales division in 1937 and two years later was appointed vice president of the division.

Harry W. Bennett recently resigned as a member of the board of directors of the Ford Motor Co. At the same time, he announced the formation of a manufacturers' representative company with **Stanley Fay,** his former assistant at Ford, and **Byron Geller,** an attorney, as partners.

Thomas W. Skinner has been appointed general manager of the Lincoln Div., Ford Motor Co., while **Frank J. Denney** will serve as sales manager. Mr. Skinner, who has been assistant director of sales and advertising, has been with Ford for the past 20 years.

G. M. Williams, senior vice president of the Curtiss-Wright Corp. and executive vice president of Wright Aeronautical Corp., has returned to the presidency of the Russell Manufacturing Co., Middletown, Conn.

N. F. Adamson, formerly general sales manager, has been elected vice president in charge of sales and engineering of the Twin Disc Clutch Co., Racine, Wis.

Edward M. Whiting, vice president and director of the Pheoll Manufacturing Co., Chicago, has been elected president, succeeding the late **Mason Phelps.**

F. H. Hoge has been elected president of the W. A. Jones Foundry & Machine Co., Chicago, succeeding **William Coleman.**

R. N. Landreth has been appointed assistant to the vice president of the general machinery division, Allis-Chalmers Mfg. Co., Milwaukee, Wis.

F. G. Gerard, formerly plant superintendent of the Eastern Stainless Steel Corp., Baltimore, has been elected vice president in charge of operations of the Washington Steel Corp., Washington, Pa.

John P. Faver has been appointed assistant to the general manager and consulting engineer, while **J. E. Bushnell** was promoted to chief engineer and **George W. Cronk** to chief draftsman of the Ransome Machinery Co., subsidiary of Worthington Pump & Machinery Corp.

Harry L. Whitney has assumed the post of domestic sales director for the Nicholson File Co., Providence, R. I. Mr. Whitney succeeds **Wallace L. Pond,** who recently retired after 50 years with the firm.

John D. Gordon, formerly general sales manager of Progressive Welder Co., Detroit, has been advanced to general manager, while **Carl L. Halpin** has been appointed manufacturing works manager.

W. Dean Robinson has been named president and general manager of the Briggs Manufacturing Co., Detroit, succeeding **W. P. Brown,** who recently resigned. Mr. Robinson was formerly a vice president and assistant general manager.

George O. Boomer, vice president of Tube Turns, Inc., Louisville, Ky., was recently elected president. He succeeds **Rudy E. Fritsch,** who resigned early in October.

Ray P. Johnson has been appointed assistant to the general manager of the Morse Chain Co., with offices in Detroit.

John Seubert was recently elected president of the K-D Lamp Co., Cincinnati, to succeed **H. R. Kerans.**

George S. Forman has been appointed factory representative in Latin America for the Baker Industrial Truck Div., The Baker-Raulang Co., Cleveland.

Dr. Earl W. Flosdorf is now full time director of research and development for the F. J. Stokes Machine Co., Philadelphia.

Thomas H. Langan has joined the Janitrol sales department of Surface Combustion Corp., Toledo, as assistant to the manager of the Cleveland district office.

Harold J. Thompson has been appointed district manager of the Reliance Electric & Engineering Co. in Gary Ind., to serve the northern Ind. district. He will make his headquarters in the Gary National Bank Bldg.

John Thompson, for the past 20 years chief engineer of The Pipe Machinery Co., Cleveland, will serve as sales representative for Pipe Machinery and other oil country goods in Phoenix, Ariz.

G. N. Emmanuel has joined the metallurgical staff of The Babcock & Wilcox Tube Co., Beaver Falls, Pa. as research metallurgist.

Charles H. Morse III has been elected vice president of Fairbanks, Morse & Co., Chicago. He will be in charge of research, patents, traffic, the company's western pump division, and the Inland Utilities Co., a subsidiary. His headquarters will be in Chicago.

Charles H. Morse

R. G. Lagerfeldt

Ralph G. Lagerfeldt has been elected vice president, and **Francis E. Pethick** treasurer of the Colonial Broach Co., Detroit. In his new position, Mr. Lagerfeldt will have charge of all sales activities.

E. J. Bredeson has been named manager of the Muncie, Ind. plant of Chevrolet to succeed **H. A. Leary,** who has retired after 20 years with the division.

George T. Fraser has been appointed Rexalloy Division manager of the Crucible Steel Co. of America succeeding **I. S. McReavy,** resigned.

William C. Uecker has been made treasurer and sales manager of the Carbide Die & Mold Co., Pittsburgh, while **Ernest G. Merlin** has become secretary and sales representative.

W. Harrison Lackey has been named sales representative for York, Pa. and vicinity for Lukens Steel Co. and its subsidiaries.

L. D. T. Berg, for the past five years a sales engineer in General Electric Company's electric welding division, Schenectady, N. Y., has been appointed welding specialist of the company's Atlantic district with headquarters in Philadelphia.

Frank Davis has joined Samuel Harris & Co., Chicago, where he will be in charge of the new cutting tool division. He was formerly tool supervisor at the Allison plant in Indianapolis.

Robert A. Parks, formerly district manager for Jessop Steel Co. in Washington, D. C., has been named general manager of the firm with headquarters in Washington, Pa.

C. G. Allen has been appointed a member of the research and development staff of the Bryant Heater Co., Cleveland.

NEW CONSTRUCTION

General Motors Corp. has acquired land south of Framingham, Mass. where it will erect a plant to assemble Buick, Oldsmobile and Pontiac cars. Building is expected to start early in December and eventually 3,000 people will be employed at the new plant.

The Ross Heater & Manufacturing Co., Inc., Buffalo, N. Y. expects to spend approximately $100,000 for construction of a new one story addition to the present plant. A substantial amount will also be spent for new equipment and machinery.

The Fisher Body Div., General Motors Corp., has started construction of a stamping plant at Hamilton, Ohio. The new plant, which will produce body stampings and sheet metal components, is expected to be ready for operation by May 1946.

Borg-Warner Corp., Chicago, will spend between 20 million and 25 million dollars in the next two years for new building construction, plant additions, the purchase of new equipment and replacement of wornout and outmoded machinery.

The American Bridge Co., Gary, Ind. plant, expects to continue its modernization plans started before the war to increase the working area of the plant by 10%.

Dremel Manufacturing Co., Racine, Wis., is making plans for the construction of a new and modern functional plant to house expanded facilities of the firm.

Hercules Powder Co. will construct a new plastics laboratory early in 1946 at its Parlin, N. J. plant.

BUSINESS ITEMS

The Plan-O-Mill Corp., Hazel Park, Mich., has appointed the **Bert Carpenter Co.,** Birmingham, Mich., as sales representative for its machine tools in Mich. and northern Ohio.

Geroter May Corp., Logansport, Ind., has appointed **Garco Machinery Co.,** Cleveland, Ohio as its representative in that territory for Geroter air and hydraulic valves, cylinders and hydraulic pumps.

Ladel Conveyor & Manufacturing Co., New Philadelphia, Ohio, has acquired the **Joy Manufacturing Co.** of Pittsburgh, which also operates a large plant at Franklin, Pa.

Briggs Clarifier Co., Washington, D. C. and Bethesda, Md., has appointed **Weeks Engineering Co.,** St. Louis, Mo., as industrial products distributor in eastern Mo., southern Ill., and southern Ind. The **Equipment Supply Co.,** Salt Lake City, Utah, has been appointed distributor for Briggs oil infiltration products in Utah; Unita county, Wyo.; southern Idaho and eastern Nev.

Security Engineering Co., Inc., Whittier, Calif., has been acquired by the **Dresser Industries, Inc.**

Carboloy Co., Detroit, has appointed **Samuel Harris & Co.,** Chicago, as authorized distributor of carbide tipped cutting tools in northern and central Ill., northern Ind., southern Wis., southwestern Mich. and eastern Iowa.

McDonald-Coolidge & Co. has purchased a substantial interest in **The Lucas Machine Tool Co.,** Cleveland.

National Malleable & Steel Castings Co. opened a southern sales and service office Nov. 1 in Richmond, Va. under the direction of **William M. Blackmore,** district sales manager.

The motor division of **Utah Radio Products** has been purchased by **Electro-Engineering Co.,** Oak Park, Ill. Upon completion of war contracts, the Electro-Engineering Co. expects to produce permanent magnet motors.

Copper Wire Products, Limited's general office and factory is now located at 137 Oxford St., Guelph, Ont., Canada.

The Watson-Stillman Co., has named **Canadian Vickers Ltd.,** Montreal, Que., to manufacture its entire line of hydraulic equipment in Canada.

Robins Conveyors, Inc., Passaic, N. J. opened a new office Nov. 1 in the Brown-Marx Bldg., First Ave. & 20 St., Birmingham, Ala. under the direction of **Charles A. Thompson.**

American Chain & Cable Co., Inc., Bridgeport, Conn. has acquired the business of the **Certified Gauge & Instrument Corp.,** Long Island City, N. Y.

OBITUARIES

William E. Kane

William E. Kane, 79, president of Kane & Roach, Inc., Syracuse, N. Y., which he founded 58 years ago, passed away Oct. 11. Mr. Kane was the inventor of over 400 machines, many of which are used in the steel industry throughout the world, including a power-boring machine, a straightener and a cold-roll forming machine.

William C. Williams, Jr., 61, vice president in charge of the accessory division, General Motors Corp., died Nov. 2. Mr. Williams, who joined the Chevrolet Div. in 1913, held various positions with the corporation before becoming vice president five years ago.

Lewis T. Marks, 51, superintendent of the equipment and assembly shops of the Western Electric Co. plant at Kearny, N. J., died Nov. 3. Mr. Marks was first employed by Western Electric in Chicago in 1913.

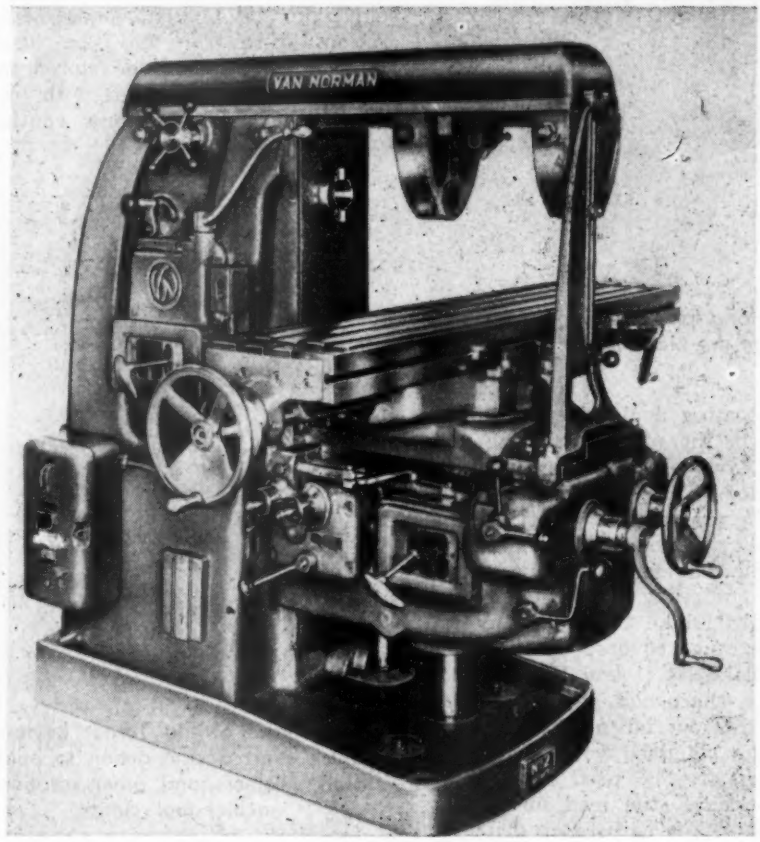
Henry Zschech, 73, formerly with E. C. Atkins & Co., Indianapolis, passed away recently. Mr. Zschech retired in 1943 due to failing health after 55 years of continuous service.

MEETINGS

American Society of Mechanical Engineers. Annual meeting. Hotel Pennsylvania, New York, N. Y. Nov. 26-30. Ernest Hartford, assistant secretary, 29 W. 39 St., New York, N. Y.

Shop Equipment News

Van Norman Horizontal Miller Improves Negative-Angle Milling



Controls of the Van Norman miller are duplicated at the rear to permit operation from any position

The No. 2 Heavy Van Norman Milling machine, a product of the Van Norman Co., Springfield 7, Mass., is designed for a wide range of production and general-purpose milling applications.

The column and base are heavier and larger with internal ribbing to assure rigidity for the spindle, spindle transmission as well as the knee. A feature included in the design is a heavy, large-diameter fly-wheel mounted on the inside of the column to assure uniform application of power to the cutter.

The cutter spindle is large in diameter and mounted on double-opposed Timken bearings at front, double Timken bearings in the center and straight roller in rear. The spindle transmission incorporates wide face-hardened alloy-steel gears mounted on multi-splined shafts rotating on taper roller bearings.

Front and rear directional control of all power feeds and manual feeds, actuated in the direction of desired movement, permit operation of the miller from front or rear position.

Single-lever speed and feed selectors provide selection of 18 speeds and 18 feeds.

The ram-type overarm has a dovetail bearing on the column with locking means on front and rear of column. A pilot wheel enables the operator to position the overarm in any desired position.

Other features include spindle operator lever which can be positioned for front or rear operation, safety devices in the knee to eliminate strain on any unit of the mechanism should any feed overload occur, large-diameter feed screw, automatic lubrication, large dials graduated in thousandths and multi-splined shafts operating on anti-friction bearings.

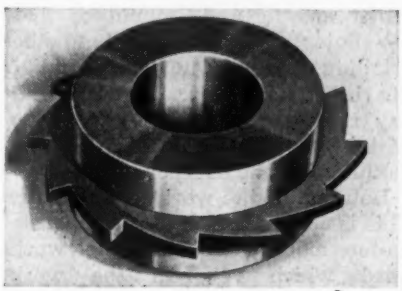
The No. 2 heavy has a table 58 x 13 in. Drive motor is 7½ hp. Longitudinal range 28 in., cross 10 in., and vertical 17 in.; 18 speeds are available from 30 to 1500 r.p.m.; 18 feeds from ⅜ in. to 32 in. The miller is available with plain or universal saddle. The universal saddle permits the table to be swiveled 45 deg. to right or left.

Gay-Lee Commutator Saws Bonded to Hub for Rigidity

A commutator slitting saw designed to reduce tool breakage is announced by the Gay-Lee Co., 117 E. Hazlehurst, Ferndale 20, Mich. Made with a steel hub to support the cutting edge permanently bonded to a Carboloy cemented carbide blade, it is intended to eliminate fracturing as a result of the strain imposed by mounting screws or nuts.

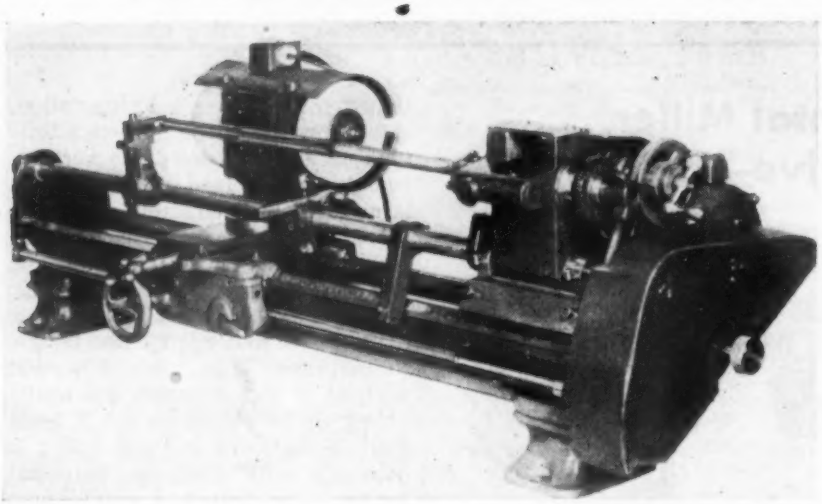
Teeth are generated to provide maximum strength and long life. Cutters are slightly concave to insure proper clearance. The blades perform undercutting and U-slotting operations to close tolerances, if required.

Gay-Lee commutator slitting saws are made in standard sizes and in special sizes to customers' specifications.



Extended area of the bond between the hub and Carboloy saw blade eliminate localized stress caused by mounting screws

Blake Long-Taper Tap Grinder Grinds Relief with Small Wheels



Wide wheels, for grinding the taper relief on long taps at a single pass, are eliminated by the small traveling wheel of the Blake Model No. 4

A tap grinder for sharpening staybolt taps, long taper reamers and other tools requiring relief grinding over long taper surfaces is announced by Edward Blake Co., 634 Commonwealth Ave., Newton Centre 59, Mass. This machine is designated Model No. 4 and is designed so the face of a narrow wheel is fed along the taper of long taps, obviating the need of a wide wheel to cover the complete taper in one pass.

The standard wheelhead and workhead from the standard Blake Models No. 1 and No. 2 tap grinders are used on this machine. The workhead is mounted on a lathe bed and the wheelhead is mounted on the lathe carriage cross slide. The controls on the cross slide give longitudinal and cross feed motions to the wheel head.

Staybolt taps and long taper reamers are held on ball centers. The tailstock center can be moved off center any desired amount so that the flutes remain parallel to the grinding wheel. Any desired relief can be obtained by a setting, and any right- or left-hand tap, up to 43 in. long, with 2, 3, 4, 5, 6, 8, or 10 flutes, can be sharpened.

Rotation of the work is automatic. This is accomplished with a separate motor mounted behind the work head which revolves the work through a chain of gears. The gears may be disengaged for hand operation. Power longitudinal feed for the wheel head is obtained by engaging the carriage lead screw.

A locating device locates the tap flutes in the proper grinding position. A wheel-truing device is also provided. This may be positioned anywhere along the pivot bar, and, after being locked, the wheel is fed past the diamond for truing.

By equipping the machine with standard Blake bushings, any taps in the range covered by the standard Blake No. 1 and No. 2 grinder can be sharpened on the chamfer, thus this special machine may be used for standard work at any time. It may also be used for grinding countersinks, the lead on reamers, 3- and 4-flute drills, step drills, and many other tools requiring relief on the point.

The No. 4 machine is regularly supplied with two 110-volt, 60-cycle, 1-phase, a.c. motors, and two 80-grit, ¾ in. face, 6 in. dia. grinding wheels.

Superdraw Drawing Compounds Remain Stable Under Pressure

Superdraw, a drawing compound that maintains its physical properties during repeated forcible stamping of ferrous and non-ferrous alloys, is manufactured by the Northwest Chemical Co., 9310 Roselawn, Detroit 4, Mich. It has a high film strength and does not separate under stress. The electrical properties of the molecules, at the interface between the lubricant and the metal surfaces, remain constant during the drawing operation because of the chemical stability of this compound. Superdraw is unaffected by atmosphere and heat, its complex organic molecules resisting chemical and physical deterioration. Chemically inert, it leaves no heavy scale nor does it leave any stain on the surface of any alloy. It may be extended to suit the draw by diluting with water. Superdraw is made in both pigmented and non-pigmented form. The high free surface energy of its particles gives a stability to its water emulsion that prevents phase separation. Thus it may be used immediately or may be stored indefinitely. It is removed with any alkaline cleaner, or any routine cleaning procedure.

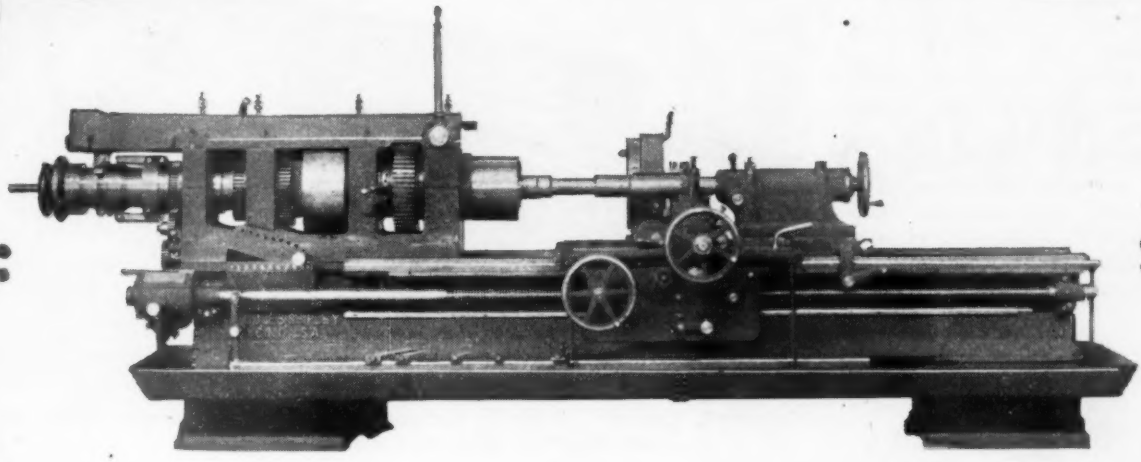
Roller jaws of the Turner keyless chuck exert a cam action to hold drills, reamers and other rotating machine-tool cutters

Turner Keyless Chuck Grip Increases with Load Pressure

A keyless chuck, manufactured by Turner Brothers, Inc., 2625 Hilton Road, Ferndale 20, Mich., holds the drill securely without the usual tightening by hand with the customary key. The Turner chuck grip is automatically and progressively strengthened with increased load pressure.

This self-energizing chuck tightens itself by the action of the drill and the hardened bearing steel roller-jaws grip the drill without chewing or scoring. The drill will not slip in use. The chuck is automatically self-centering and the drill will run true without the necessity of making adjustments by hand.

Four drill capacities available are 1/32 to 1/16 in., 1/16 to 1/8 in., 1/8 to 1/4 in. and 1/4 to 1/2 in.



CAN A 1920 LATHE *meet today's shaft job demands?*

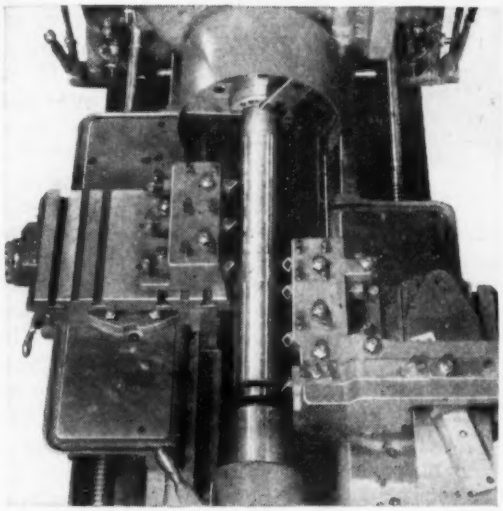
● "Sure this lathe is 25 years old. It's still running, isn't it?"

It may be running, but the real question is: *How well does it perform?* On a shaft job, for instance—how does a 25 year old "antique" stack up against a lathe built this year?

On the old model, it takes plenty of time with only one tool on the job. Traverse is returned by hand, so more time is lost. It requires a skilled operator to produce with accuracy and some degree of speed.

Compare these old lathes with a new 2A or 3A Duomatic—L & S full automatic lathes. View at the right shows seven tools turning three diameters and chamfering end of the shaft simultaneously. An unskilled operator on a Duomatic accurately turns out dozens of shafts automatically, while the old lathe turns one.

You can save time and money, meet the keenest competition if you're well equipped. One Duomatic can likely replace several of your "antiques" or war-weary lathes. Investigate now! Call on L & S Engineers for a complete analysis of your lathe problems. There is no obligation.



On the Duomatic, multiple tools can be used to full advantage, in turning and in straight and angular facing operations. It's like two lathes in one. Dual tool slides—front and rear—operate singly or together, permit a wide range of cycles never before possible. Write on your company letterhead for detailed Bulletin No. 601.

THE LODGE & SHIPLEY MACHINE TOOL CO.

L & S LATHES

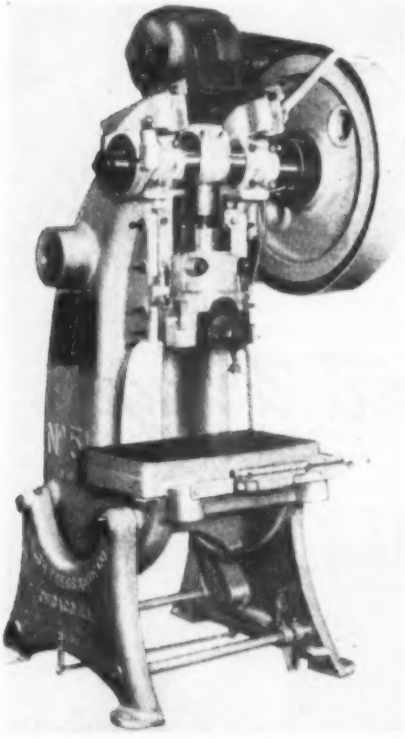
CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

Pennsalt Descaling Compound Contains Corrosion Inhibitor

Pennsalt PM-90, an acid cleaning and descaling compound, has been developed by the Pennsylvania Salt Manufacturing Co., Widener Bldg., Philadelphia, Pa.

Pennsalt PM-90 contains additive agents for corrosion inhibition. It is primarily used as a pickling bath concentrate and as an acid cleaner for removing water scales from boilers and industrial equipment.

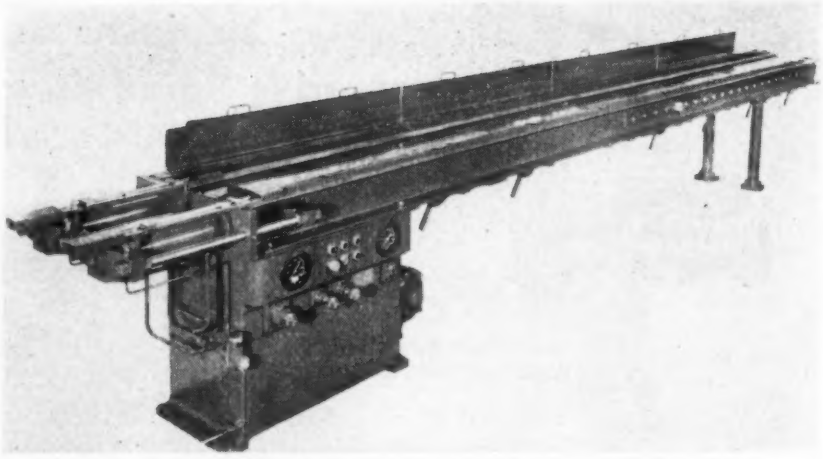


Ram of the Walsh punch press cannot be lowered before the operator releases two safety buttons

Walsh Punch Presses Powered For 6 to 80 Ton Capacities

The Walsh Press & Die Div. of American Machine & Gage Co., Chicago, Ill., announces a line of punch presses ranging in size from 6 to 80 tons capacity. All sizes feature ground forged-steel crankshafts, hand scraped bearings, solid web wheels and gears, inclinability, an adjustable die head, high-speed operation and a two-button safety device for protection of operators.

The safety device requires that both hands of the operator be placed on the buttons and clear of all operating action before the interlocking mechanism will permit the ram to lower.



Automatic load-limit device in the Barnes tensile tester permits its use for pre-loading cables to reduce elastic properties

Barnes Tensile Strength Tester Pre-Loads Cables Automatically

A tensile-strength tester developed by the John S. Barnes Corp., Rockford, Ill., is adaptable to testing the tensile strength or modulus of elasticity of chains, wires, cables, bar stock and similar materials. This machine may also be used to give a definite set to chains.

The Barnes tensile-strength tester is 25 ft. long, and can accomodate chains and cables of any length up to 20 ft. Easily adjusted platforms are provided to eliminate sag, thereby insuring maximum accuracy in testing. Two 4-in. bore x 8-in. stroke low friction cylinders provide initial test loads up to 1500 lb. Final test loads may be as great as 15 tons.

One chain or cable can be under test while another is being prepared. The operator is protected from possible injury from chain or cable breakage by a safety cover over the chain or cable under test.

A timing device automatically removes the test load. Elongation of the metal under test is registered automatically on verniers on the front of the machine in convenient reading position. Verniers may be reset to zero at any time during the test, thus permitting comparative readings for any portions of the test cycle. Verniers retain their maximum readings until they are reset.

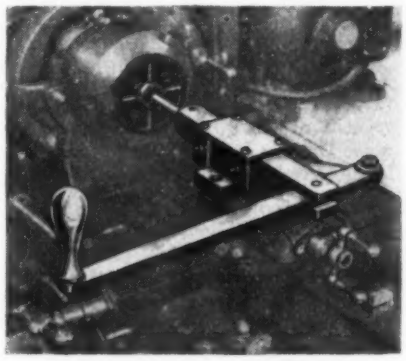
CORRECTION

In publishing the description of the Model C Milwaukee Autometric Boring Machine, several mistakes occurred. The headline should have read "Autometric Boring Machine Facilitates Precision Boring Operations" and the caption, "The *lead* of the measuring screws is accurate to within 0.0001 in. in any one inch, and to 0.0002 in. within any 12 in." The address of Kearney & Trecker Products Corporation is, of course, Milwaukee, Wis.

Watkins Keyseaters Adapt Lathes to Shaper Operation

A lathe accessory, designed to simplify internal keyseat cutting with Atlas, Craftsman, and similar lathes, is announced by the John E. Kandler Co., Kalamazoo, Mich.

This attachment, called the Watkins internal keyseater, is anchored to the compound slide as easily as a toolpost in 30 sec. With his right



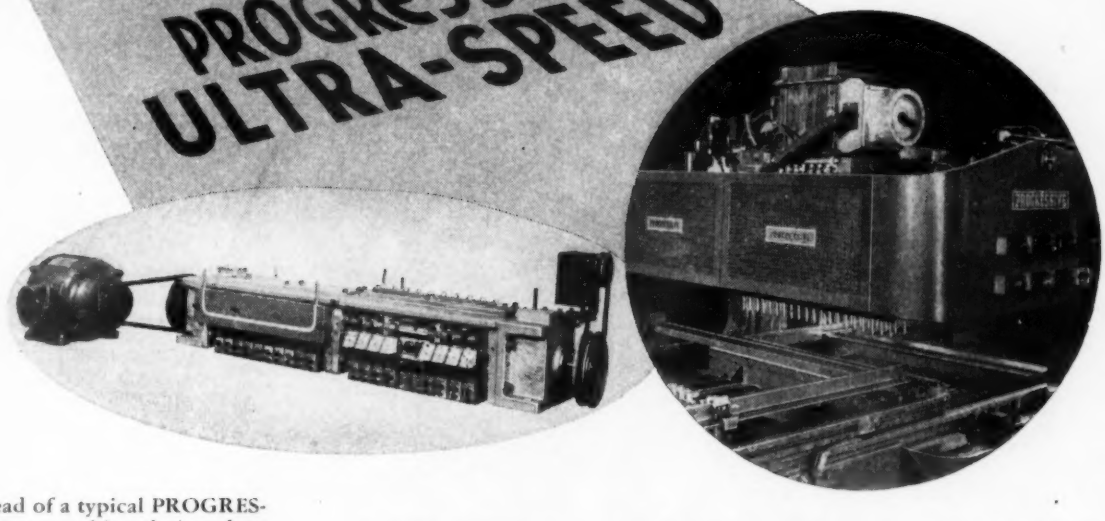
Watkins keyseaters are actuated when the operator moves the ram handle. Splines can be cut by positioning with the hole circle on the lathe bull gear

20 SPOTS
40 SPOTS
60 SPOTS
OR MORE

IF YOUR ASSEMBLY NEEDS THAT MANY WELDS

it's a job for a

PROGRESSIVE ULTRA-SPEED



Above, right: Head of a typical PROGRESSIVE Ultra-Speed on a machine designed to weld a series of double rows of 40 spots in a large panel assembly. (Automatic indexing to 1/1000 inch; high speed "approach" to welding position; automatic cycle.)

Above: Heart of PROGRESSIVE Ultra-Speeds is this control unit with many exclusive PROGRESSIVE features.

Typical Applications for the Progressive Ultra-Speed

AUTOMOTIVE

Floor-pans Rear Decks Doors Frames Roof Assemblies Windshield Openings

REFRIGERATOR

Doors Panels Trays

STOVES

Panels Doors

With the Progressive Ultra-Speed you weld the spots automatically at almost unbelievable rates—welding speeds up to 900 spots per minute are possible.

The welding guns apply the pressure on the work all at the same time, thus clamping it firmly in proper position before welding. They remain in contact after welding, thus eliminating sparking at electrodes.

The Progressive Ultra-Speed is versatile and you can projection weld as well as spot on the same job, using the type of welding best suited to each location or metal thickness.

Electrodes can be arranged in circles, rows, curves, stepped, etc.

NOTE: PROGRESSIVE Ultra-Speed machines are custom designed and built to order for the specific job, using standardized sub-assemblies to reduce initial cost and increase salvage value. We will be glad to tell you about the many exclusive features of the PROGRESSIVE Ultra-Speed.

Write us for further information

IT PAYS TO WELD

PROGRESSIVE Welder Co. 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT

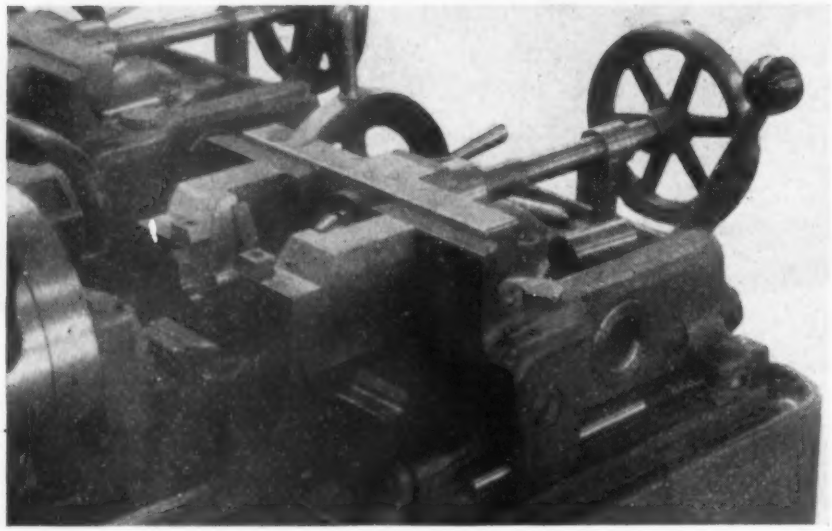
hand working the long lever, the operator produces reciprocating ram motion. His left hand determines the depth of cut, using the graduations on the crossfeed dial. The average time for cutting a standard 3/16-in. internal keyway is 1 min. In cutting multi-keyseats or splines, all spacings divisable in 60 are obtainable by using the hole circle on the bull gear of an Atlas lathe.

In combination with cutting tools of the right shape, this attachment is useful for straight oil grooves or gear teeth. A chuck setup can be made for cutting outside keyseats and splines on shaft ends and, since it mounts on the compound slide, it is adjustable for cutting keyways in tapered holes and shafts.

Standard equipment with this keyseater includes one 1/8-in. cutter, one 3/16-in. cutter, and two Allen wrenches.

Ballbearing support for the torque load in the JOMI wrench prevents variance in the friction load

Landmaco Work-Holding Fixture Assures Thread Concentricity



The work-holding fixtures for use when threading hypoid gears on the Landmaco threading machine aligns the gear by supporting the splined end of the shaft

The Landis Machine Co., Waynesboro, Pa., has developed a work-holding fixture for use with the Landmaco threading machine to thread hypoid driving gears and maintain close tolerances of concentricity. In threading hypoid driving gears, the tolerances require concentricity between the thread, shaft and gear. The part presents no satisfactory driving means other than the splined end of the shaft and, therefore, the drive is located within the bore of the die head.

The fixture comprises a traveling center, located within the bore of the head and machine spindle, combined with a splined bushing to drive the work, and a manually operated work center on the machine carriage, combined with a cradle-type support to locate the work for alignment with the work center. The work is placed on the supporting bracket and advanced with the carriage-operating handwheel until the splined end of the shaft engages the splined sliding bushing and center within the bore of the head. A handwheel is then employed to advance the rear center to engage the gear end of work.

The work-supporting bracket or cradle is detachable from the machine-carriage front and can be interchanged with other similar brackets which may be designed to accommodate any other odd shape of work.

JOMI Torque Wrench Improvement Eliminates Frictional Error

The JO Manufacturing Co., South Gate, Calif., announces several improvements in the JOMI torque wrench. The company has added another wrench, Model 1600, to the line. Model 1600 is a heavy-duty wrench with a torque range from 700 to 1600 in. lbs. and a ½-in. standard drive. At the same time, Model 600 has been changed to Model 750, with a torque range of 100 to 750 in./lb., and a ⅜-in. standard drive.

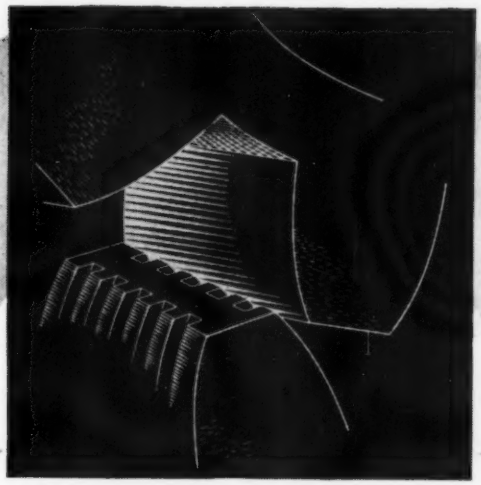
All moving parts pertaining to the torque control feature of the wrench are now ballbearing, reducing error due to friction. With the JOMI it is unnecessary to compensate for a frictional load. Variance due to a variable friction load has been entirely eliminated. Over-tightening is impossible with the wrench. Once set, it automatically breaks when the pre-determined torque has been reached. The operator instantly sets the tool by turning the guide to the desired micrometer reading on the barrel.

The rubber-capped head has been discontinued and in its place is an all-metal head. Both the head and the handle are now made of heat treated aluminum. All materials used in the construction of the JOMI are rustproofed.

M-B Air Grinder Operates At High Peripheral Speeds

M-B Products, 132 E. Larned St., Detroit 26, Mich., manufactures a heavy-duty pneumatic grinder model HD-CR, which operates at 40,000 r.p.m. It can be fitted with three different spindle noses to handle mounted wheels with ½-in. dia. shanks and unmounted wheels with ¼- and ⅜-in. dia. holes. Grease-sealed bearings require no lubrication.

Wheels for this grinder must be of sufficient strength to withstand the centrifugal forces generated by the high speed of operation.



There Are

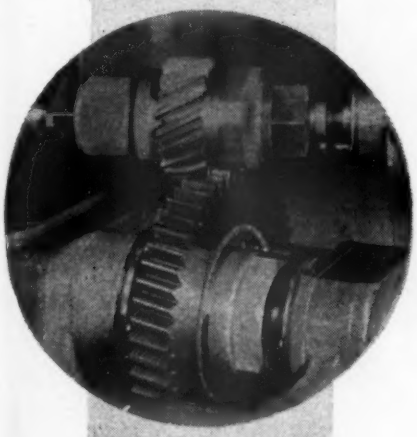
TWO WAYS

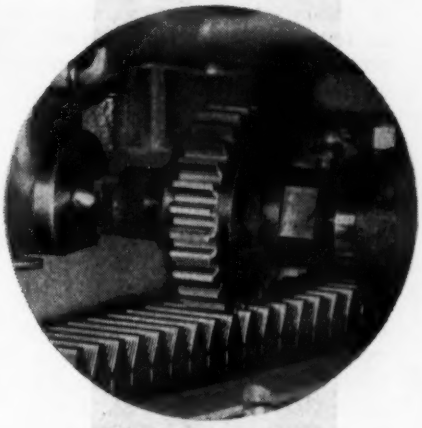
To Obtain

PRECISION GEARS

at

LOW COST





RACK SHAVING:

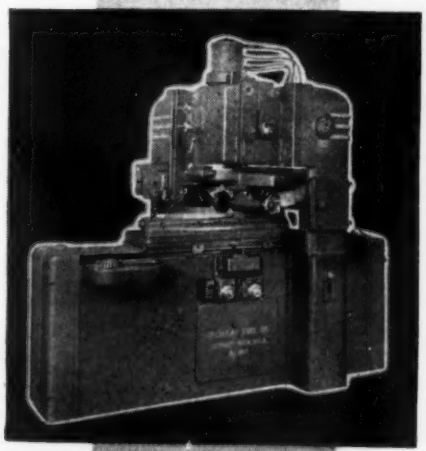
In high production there is no substitute for rack-shaving either as to precision obtainable or as to cost per gear.

Ask for Bulletin 900

ROTARY SHAVING:

Where varieties of gears in semi-production are to be produced or where quantities are lower, rotary shaving will produce gears at lower cost.

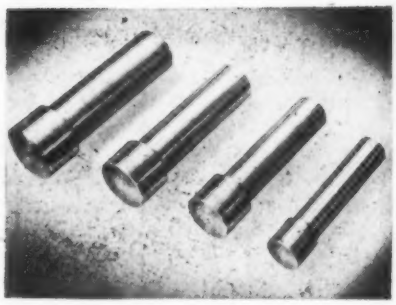
Ask for Bulletin 860



The whole story is told in Manual GF-43 available from

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD **DETROIT 12, U. S. A.**



Barnaby rotary stock stops are constructed to permit rotation of the contact end

Barnaby Rotary Stock Stops Rotate Freely with Bar Stock

A rotary stock stop, manufactured in four sizes for use on automatic screw machines and turret lathes, is announced by Barnaby Manufacturing and Tool Co., Bridgeport, Conn.

Barnaby rotary stock stops have a live head which rotates freely with the bar stock, eliminating friction between work and stop. Thus, there is no marring of the finished stock end during feed. Elimination of friction between stock and stop reduces wear in screw-machine mechanisms and on turret lathes it lessens operator fatigue.

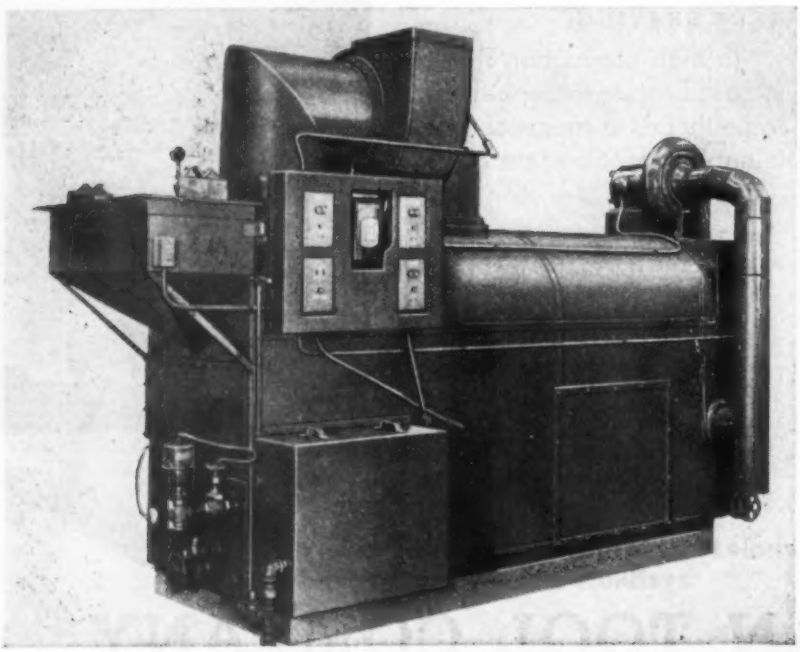
Elimination of wear on the end of the stop increases accuracy of the positioning mechanism.

The stops have no backlash and are built to withstand hard wear and repeated impact. Regularly furnished with a flat end, they can be furnished with the rotating member made to accommodate formed or tapered stock ends. Stock stops of the latter design have a floating construction to insure accuracy of alignment.

Optimus Parts-Washing Machine Rinses, and Dries with Air

A machine especially designed for the rinsing and drying of screw-machine or small stamped parts, has been announced by Optimus Equipment Co., 151 Church St., Matawan, N. J. The screw-drum type machine can be used for washing and drying, or rinsing and drying, or any part of these operations. It is also adaptable to a wash-drain, rinse-drain, cold or hot air-dry operation sequence and can also be adapted for pickling operations. The air stream passes through a heater and blower, providing for cold- and/or hot-air blast. Air loss is avoided by the completely inclosed dryer end.

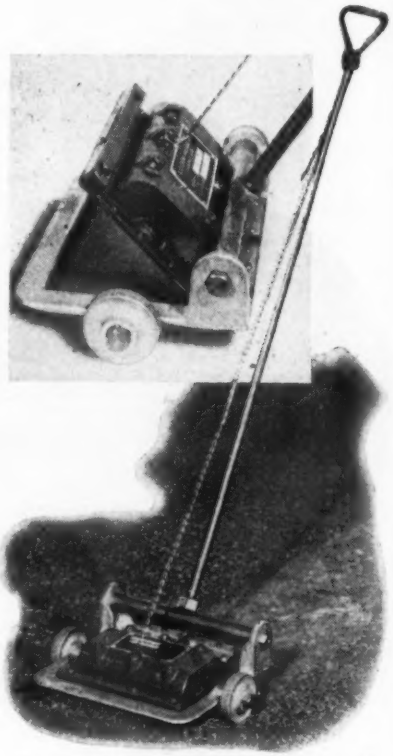
The various parts of the machine are readily accessible for lubrication, maintenance or alterations and cleaning. Centralized lubrication may be provided.



Optimus washing machines complete all parts-cleaning in one unit

Sjostrom Magnetic Sweepers Collect Ferrous Chip Scrap

A magnetic pickup, for removing ferrous chips from floors, is manufactured by the Sjostrom Machine Co., Lawrence, Mass. When the wheeled assembly of three large permanent magnets, a plastic separator, and aluminum chassis is passed over an accumulation of chips, the magnetic flux pulls the ferrous material to the plastic separator. When it is desired to dump the load, the sweeper lifts the magnet by a handle and chains, and the material falls away from the plastic separator. Weight of the unit, including magnets, is 28 lb.



Floor chips can be removed with minimum effort by the Sjostrom magnetic pickup

Schauer Speed Lathe Provides Optional Operating Sequences

A light-duty speed lathe made by the Schauer Machine Co., 2067A Reading Rd., Cincinnati, Ohio, is designed for general finishing operations on small metal and plastic parts.

Hand operating lever may be set on the right or left hand side of the lathe, and in either vertical or horizontal position, whichever the oper-

Where *Precision* Is A REQUIREMENT

IT'S A JOB FOR LINCOLN PARK

Special precision work such as that illustrated can always be handled most efficiently and economically when it is entrusted to men who *constantly* work to high precision standards.

Lincoln Park has a department devoted exclusively to special work. Here the experience of skilled gage makers and the facilities of one of the country's finest gage plants are combined to produce extremely accurate special gages, tools, dies, fixtures and parts. Let us show you how the services of this department can be used most advantageously by you.

LINCOLN PARK INDUSTRIES, INC.

Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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Schauer speed lathe is equipped with two optional clutch and switching arrangements

ator finds most convenient. Only 5 lb. pressure on the lever is required to open the collet. Simple adjustment affords the operator a choice of two operating sequences: In one, the operating lever opens motor circuit, applies brake and opens collet. In the other, motor operates continuously, brake is locked out, and operating lever is only used to open and close collet.

Motor is single speed, 3450 r.p.m., ¼ hp. for 220-440 volt, 60 cycle, 3 phase current. Machine is designed to use type 3C collets with maximum capacity for ½-in. round stock, and can also be equipped with a 3-in., 3-jaw, light-duty chuck. A ½-in. clear hole through the spindle permits rod or bar stock or long work to be handled.

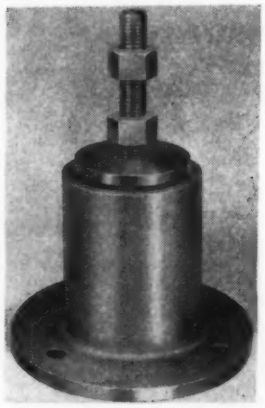
Vibro-Levelers Stop Vibration And Act As Leveling Jacks

A line of rubber insulated machinery mountings for damping vibrations from machinery and having a means of leveling the machinery is announced by Bushings, Inc., Coolidge Highway at 14 Mile Road, Royal Oak, Mich.

The mountings, known as Vibro-Levelers and manufactured in nine sizes ranging in load capacities of from 10 to 2,000 lb. each, are for use on punch presses, compressors, blowers, forging hammers, grinders and buffers and are designed to be installed with no floor cutting or fitting. Brackets, available in various capacities, permit installation of the mountings without materially raising the elevation of the machine.

Being of synthetic rubber, the insulating material employed is not liable to attack by oils or greases. The synthetic rubber insulating material separates an outer shell, which also forms the base of the mounting, from an inner cylindrical member, to which is fastened a single stud.

Leveling is by means of two nuts supplied with each mounting; one nut is for adjusting the machine to the exact level desired; the other, for locking in the leveled position.



Insulation material in the Vibro-Leveler is oil-resistant synthetic rubber

Although available in sets of four, the machinery mountings can be used in any number required.

When used to support equipment where the operating height is not important, the mountings are usually placed immediately under the base of machine. Where the machinery is already installed and the height must be maintained at approximately the same level, a series of standard brackets are available.

Standard brackets are of two types—Z and angle. The Z brackets attach to existing hold-down bolt holes in the base and require no cutting or welding to attach to the machine. The angle brackets are for mounting to the side of the machine base with bolts or by arc welding.

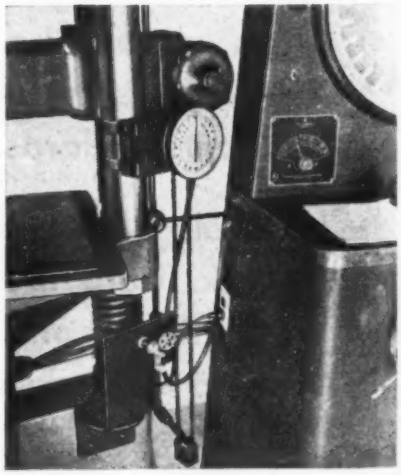
Tri-Bits for Boring Bars Lock in Triangular Slots

The triangular-shaped toolbits known as Tri-Bits, which are manufactured by Weddell Tools Inc., 1985 Main St., East Rochester 9, N. Y., have been adapted for use in boring bars. One or more Tri-Bits are fitted into triangular holes in the bar, tying the boring-bar body around the blade. The triangular bit is locked securely into a V seat by a single clamping screw and is backed up and adjusted by a backing screw. High pressures of heavy cuts tend to lock the bit more securely.

Southwark Ram Pacer Holds Load Speeds to Specification

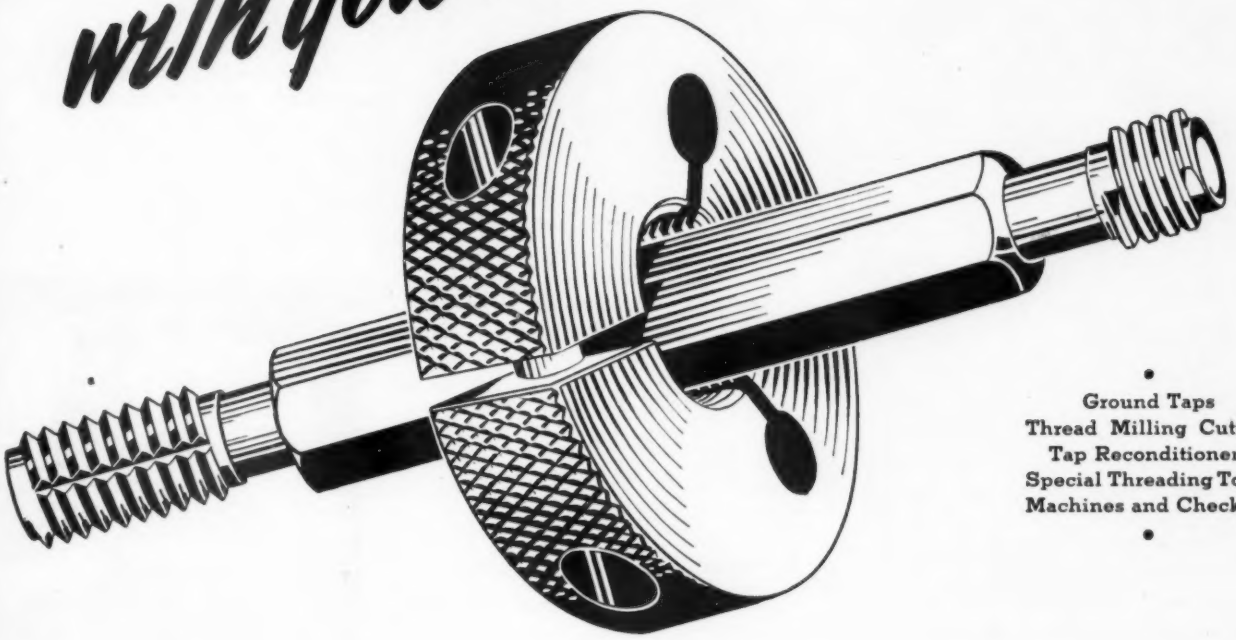
In testing metals, plastics and woods many specifications require that the loads be applied at certain and exact speeds. To fill this need, the Baldwin Locomotive Works, Philadelphia 42, Pa., has developed the Southwark Ram Pacer.

The device, which attaches to a standard hydraulic testing machine, gives control over the crosshead movement at eight preset speeds, 0.01, 0.02, 0.05, 0.1, 0.2, 0.4, 0.5, and 1.0 in. per min. These speeds are obtained by gear changes on the synchronous-motor drive unit. This unit is attached to the fixed frame of the machine while the dial portion of the apparatus is attached to the moving crosshead. The pointer sprocket wheel and the sprocket wheel on the drive unit are connected by an endless weighted chain. With the gear selected for a certain speed, the hydraulic valve of the testing machine is opened until the loading head rises to a point where the dial pointer stands still. This means that the pointer sprocket and the motor-driven sprocket below the moving at exactly the same speed. They counteract each other.



The Southwark Ram Pacer actually is a combination tool as it also can be used as a deflectometer. The dial is divided into 200 graduations of 0.001 in. each, and if the synchronous motor is not turned on, the dial will indicate the deflection of a specimen under test. With this arrangement, specimens can be tested to load-speed specifications and deflection without changing the machine setting

Don't get caught with your tolerances down



Ground Taps
Thread Milling Cutters
Tap Reconditioners
Special Threading Tools
Machines and Checkers

BIRMINGHAM, Ala....Birmingham 7-1017
BUFFALO 2, N. Y.....GRant 6601
CHICAGO 12, Ill.....KEdsie 3170
CINCINNATI 2, O.....MAin 2544
CLEVELAND 13, O.....CHerry 3520
DAYTON 2, O.....FUlton 6161
DENVER 2, Colo.....KEystone 7229
DETROIT 11, Mich.....MAdison 0260
FLINT, Mich.....Flint 4-3661
HOUSTON, Tex.....CApitol 5487
INDIANAPOLIS 9, Ind.....FRanklin 2456
LOS ANGELES, Calif.....ADams 1-4381
MILWAUKEE 2, Wisc.....DAily 4256
MINNEAPOLIS, Minn.....MAin 1488
MUSKEGON, Mich.....Muskegon 248
NASHVILLE 6, Tenn.....Nashville 6-3647
NEWARK 2, N. J.....MArket 3-1493
PITTSBURGH 19, Pa.....ATlantic 3011
ROCKFORD, Ill.....MAin 2243
ST. LOUIS 1, Mo.....CEntral 4435
SAN FRANCISCO, Calif....DOuglas 7711
SOUTH BEND 3, Ind...South Bend 3-0009
SYRACUSE 9, N. Y....SYracuse 8-1462
TOLEDO 4, O.....GArfield 8302
MONTREAL, Canada.....MAin 5346
TORONTO, Canada.....WAverly 2688
WINDSOR, Canada.....Windsor 4-9229

History shows that industry never turns backward. This applies to tolerances, also. During World War II, thousandths and half thousandths shrank to one or two-tenths. Peace-time industry, in all likelihood, will continue to work to these—and even closer—tolerances.

You can obtain *from our stock*, for immediate delivery thread plug and ring gages, which will assure you that your threads are being held to today's close tolerances.

The Detroit Tap Representative in your area will be glad to advise you of the number of each size of gage in stock at any given time. Give him a call today.

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TAP & TOOL CO.
8432 BUTLER AVENUE DETROIT 11, U. S. A.

All-Steel Frames Provided With Binkins Drawing Board

A drawing board with an all-steel frame, the main member of welded tubular steel reinforced with angle pieces, is manufactured by the Binkin Tool & Mfg. Co., 1513 Springwells Ave., Detroit 9, Mich. The

Tubular structure supporting the Binkins drawing board will not warp

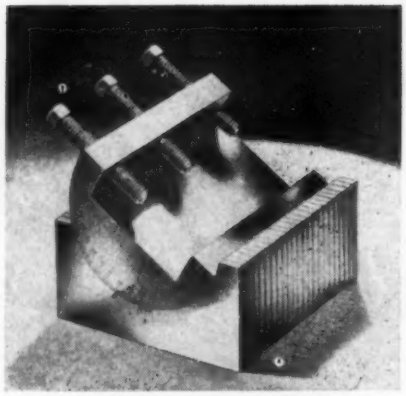
welded tubular construction is unaffected by moisture or varying weather conditions and holds the board flat at all times. The board is adjustable to a maximum tilt-angle of 60° and an up-and-down movement of 6 in. Optional equipment available includes a reference tray that is installed under the board and a light bracket assembly for 48-in. fluorescent lamps.

Parallel-Angle Magnetic Vise Simplifies Angular Grinding

The Lucas-Milhaupt Engineering Co., Cudahy, Wis., has developed a magnetic vise providing accuracy to 1 min. of arc through a range of 180°. The vise is magnetically held and clamped, and parallelism is maintained in one plane while angular adjustments are made in the vertical plane.

The base of the vise consists of copper and steel laminations, permanently fused into a solid unit, in which a semi-circular recess is machined to receive the rotating workholder. The steel workholder is machined to fit the recess in the base, permitting it to rotate 180° with respect to the base. Set screws hold the object to be ground securely in the vise.

In operation, the vise is set to the desired grinding angle by means of



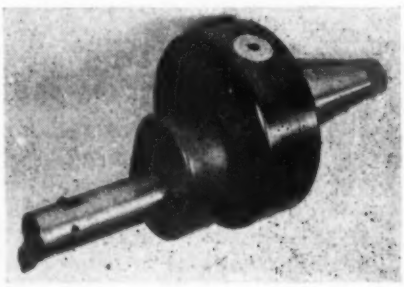
The magnetic vise assures longitudinal parallelism to 0.0005 in., is simple to set, remains set throughout the grinding operation, develops no slack or wear, is sufficiently low and small to eliminate interference with the grinder, and permits a variety of operations without machine adjustments

calibrations verniered to within 10 min. The entire unit is placed upon a magnetic chuck and, when the current is applied, the vise becomes rigidly set at the grinding angle.

Criterion Boring-Head Design Eliminates Excessive Overhang

A large boring head has been developed by the Criterion Machine Works, Beverly Hills, Calif.

It is 7⅜ in. dia. and 4¾ in. long, not including shank. This compact design eliminates excessive overhang, and is in part responsible for the heavy roughing cuts that can be taken within this tool. The sliding barholder has over 21 sq. in. of bearing surface. This slide is hardened and ground, and is actuated by a ⅝-in. lead screw. The lead screw, with its widely spaced graduations, is heat treated alloy steel and the threads are ground after hardening. The back of the head carries a large



Available for use with this tool are Criterion 1¾-in. dia. boring bars. These are furnished in several lengths with either 90° or 45° ⅝-in. square broached holes

threaded hole to take a variety of shanks for various sizes of machine spindles.

Both straight and offset boring-bar holders are furnished. These bar holders are interchangeable, giving the head extra range, and also make possible special setups. They have ground holes that accommodate a 1¾ in. dia. boring bar. As a result of its rigid construction, this head is adaptable to the use of carbide tools.

The head has no projecting parts, and all working parts are completely enclosed and protected from dust, dirt or chips. It is finished in gunmetal blue. This finish is rust-resisting and, having a low reflective value, is also easy on the eyes of the operator.

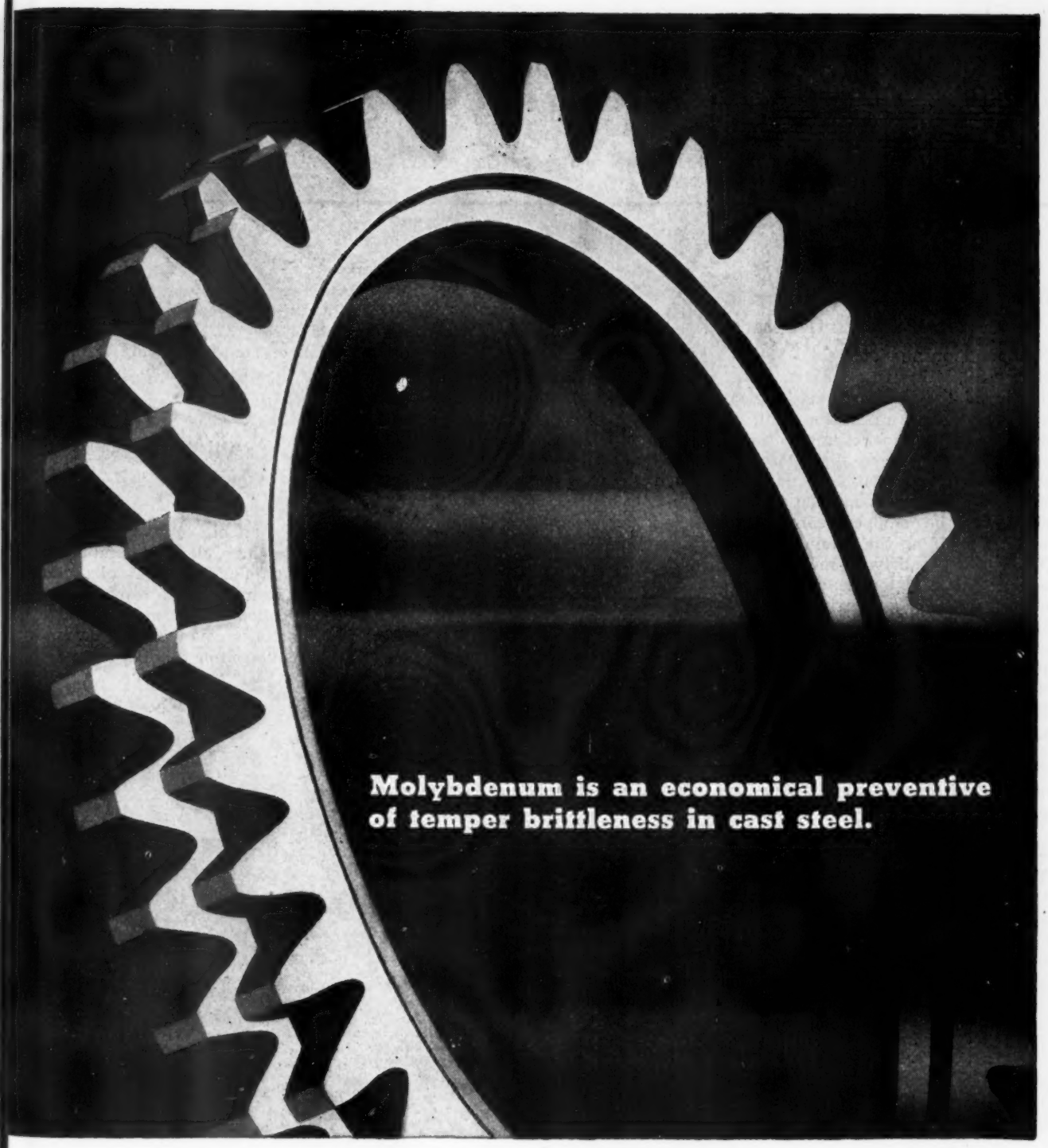
Shock of initial impact is absorbed by an hydraulic dash-pot mounted in the column

Steel City Brinell Tester Equipped with Hydraulic Shock

A brinell testing machine of the manually operated bench type for hardness testing of metals is announced by Steel City Testing Laboratory, 8843 Livernois Avenue, Detroit 4, Mich., as Superior model J.

The multi-beam and dead-weight principle is employed, with weights calibrated for loads of 500 to 3,000 kilograms. Hydraulic dashpot is incorporated, which eliminates shock on the load as it is applied.

Standard equipment consists of a flat anvil, V-anvil and a standard scale and case.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

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Parts and Materials

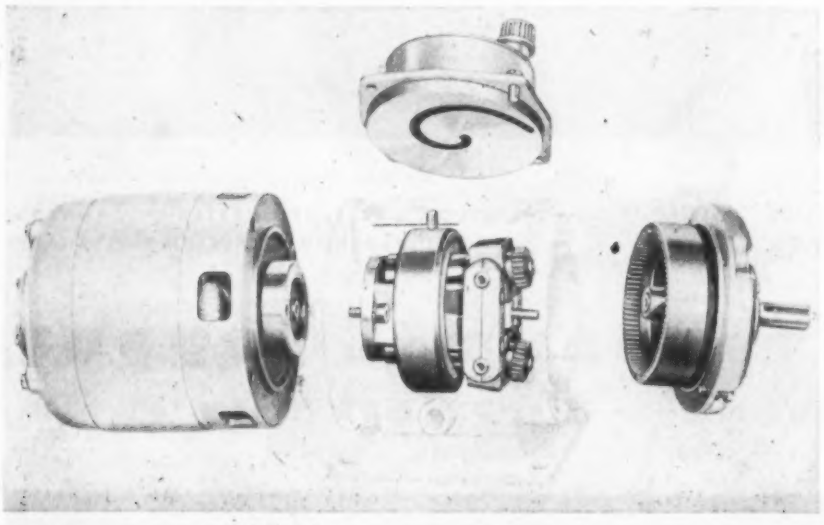
Graham Variable-Speed Drive Protects Against Overloads

Graham Transmissions Inc., 3754 N. Holton St., Milwaukee 12, Wis., have developed a metallic traction type of variable-speed transmission with a construction that makes impossible a condition of complete slip. Because the tractive output is fixed and limited under all conditions, the output shaft can be stopped completely without skidding the traction parts. This protects driven mechanisms against excessive torque, or extreme momentary overloads without damage to the transmission.

The Graham drive uses the compound planetary gear system except that the non-rotating member is a traction ring and engages two tapered rollers at varying diameters, the ring being moved lengthwise of the transmission to change the speed. The rollers are supported in a carrier and are inclined at an angle equal to their taper so their outer edge is parallel to the central axis. The required tractional pressure between rollers and ring is obtained through the centrifugal force of the rollers themselves, which are pivoted in the carrier at their small end and are thus free to press outwardly against the ring under the centrifugal force.

The pinions—because they move with the carrier—turn at constant motor speed around the central axis, and because they roll within the control ring must at the same time turn about their own axis in the opposite direction at a variable speed which is equal to motor speed times the ratio between control-ring diameter and diameter of roller at the contact point. This reverse speed is converted to a speed about the central axis by dividing by the gear ratio, and the difference between the two pinion speeds then gives the output speed of the transmission. This becomes zero when the ring-roller ratio equals the gear ratio, and thereafter reverses. The output speed, even at the maximum, is always reduced from motor speed due to the differential feature.

All Graham units are available with either of two gear sets—for standard and "B" types respectively. The standard types give speeds from a maximum approximately one-third input to zero, plus a moderate speed in reverse. The "B" types give equal speeds both sides of zero, from a maximum of approximately one-fifth input speed forward (same direction as the motor) through zero to a maximum of one-fifth input speed in reverse. When built-in reduction or step-up gearing is used, maximum speed equals the above times the gear ratio.



Simple construction of the Graham drive and accessibility of operating parts minimize maintenance and improper operation

Honan-Crane Oil Clarifiers Continuously Reclaim Coolant

Honan-Crane Corp. Lebanon, Ind., announces an oil clarifier designed to remove chips, abrasives and other solid contamination from oils and coolants in machine-tool operations.

Clarification is accomplished by multiple tubes covered with closely woven cotton filter tubing. Dirty oil enters the clarifier at the bottom, surrounds the filter tubes, passes through the cotton cloth and filter screens, rising to the clean-oil outlet and thence to operating equipment served.

T-type clarifiers remove 95 to 98% of solid contaminants from coolants and lubricants

The clarifiers function continuously to remove abrasives as fast as they are liberated, assuring a constant flow of clean oil or coolant to machine tools. The cycle of oper-

Nothing Rolls Like a Ball . . .

. . . and it looks as if the hungry gentleman above just can't digest that fundamental fact.

But, the fact that "nothing rolls like a ball" *has* been digested by machine designers. The simplicity of the *ball* bearing—which carries the loads on free-rolling, tough steel balls—is the answer to many a 64-*Million* Dollar Question.

Higher speeds, heavier load capacities, greater rigidity—in literally millions of applications—conclusively demonstrate the unique fitness of New Departure Ball Bearings for the new scheme of things mechanical.

We believe no other bearing has as many advantages as the *ball* bearing. Particularly the ball bearing backed by the technical skill, long experience and meticulous manufacturing methods of New Departure.

There is more for you in New Departure Ball Bearings than steel and precision. Advanced engineering and a desire to serve are tangible plus values.

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BALL BEARINGS

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ation is automatic, with the exception of short periods required for removal of accumulated abrasives from the cotton tubing or to replace tubing when necessary.

Its removal of dirt and abrasives from oils and coolants will, in most cases, allow better finish on products; lengthen tool life; reduce time lost in grinding tools and dressing stones; allow more continuous operation of machines; greatly extend oil life.

T-type clarifiers are built in two models. One, the T-4, designed to serve a single machine, connects directly to the oil system and utilizes oil pressure of equipment pumps. Model T-8 is equipped with its own motor-driven pump and operates independently of the equipment system, being connected with the sump. It is capable of handling oil or coolants from two or more machine tools.

Ceramic Material Withstands Extreme Temperature Shocks

A thermal expansion coefficient in the same range as that of Invar, and high resistance to extreme thermal shock are among properties of M-244, a ceramic material developed by General Ceramics and Steatite Corp., Keasbey, N. J. The material has been heated to 1400 F., then plunged immediately into ice water without cracking. It retained original dimensions at both temperature extremes within the limits characteristic of nickel-steel alloy. M-244 will be supplied in shapes formed by pressing, extruding, or casting.

Splined Rivnut Grips Plastics, Rubber and Soft Materials

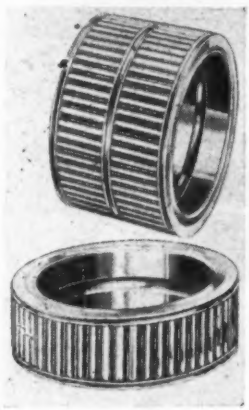
A Rivnut of the splined type suitable for use in wood, plastics, leather, hard rubber, or other material where it is necessary to firmly anchor a nut for attaching accessories, is announced by the B. F. Goodrich Co., Akron, Ohio.

In this type, splines beneath the countersunk head supply resistance to torque, while the bulge or upset which forms below the end of the splines furnishes the tension resistance. The splined Rivnut is thus locked in place two ways. Internal threads left intact within the Rivnut shank take an attachment screw for installation of accessories.

The splined Rivnut can be installed with the same type tools regularly used for heading conventional types of Rivnuts in metal. These must be adjusted, however, to accommodate the longer shank of the splined type. Like other types, it is being made in three regular sizes, 6-32, 8-32 and 10-32, in aluminum or brass.

McGill Inner Races and Rollers Decrease Installation Space

The McGill inner race and roller assembly bearing, manufactured by McGill Mfg. Co., Valpariso, Ind., may be used on applications where parts which have been heat-treated to obtain surface hardness can be

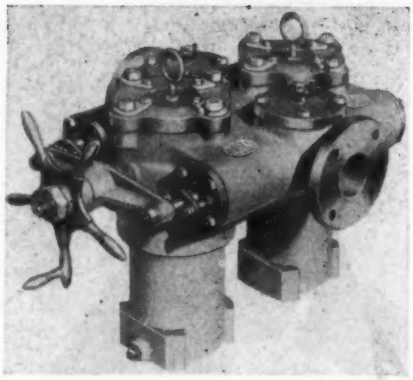


The small radial space required and the load-carrying capacity under static conditions permit shafts and members used as outer raceways to be of larger section

utilized as outer raceways. Designed as a self-contained unit and made in both single and double row, the bearing is similar in style to the Solidend Multirol bearings. Rounded-end rollers give greater load capacity; absence of loose retaining rings simplifies installation; close tolerance and great rigidity give greater bearing efficiency and eliminate vibration and noise; there are no delicate parts to warp, break or loosen. Races and rollers are made from through hardened high-carbon chrome steel. A typical application utilizing this inner race assembly is the constant-mesh gear assemblies in transmissions. The ground bores of the hardened gears act as outer raceways.

Zurn Pipeline Strainers Minimize Line-Pressure Drop

A duplex vertical-chamber disk-type pipeline strainer, manufactured by the J. A. Zurn Mfg. Co., Erie, Pa.,



Removable covers provided with the Zurn pipeline strainer permit access to the basket chamber and permit complete cleaning. Large handholes above each valve assembly permit servicing of the valves without removing the strainer

has been designed to assure continuous flow in pipelines, and is operated by a large handwheel that reverses valves simultaneously with minimum pressure drop. Capacity flow is assured at all positions of the operating handwheel. Removable covers permit access to the basket chamber.

The eccentric position of the strainer basket, so the flow section is proportional to the flow needs at all points, minimizes pressure drop. The usual practice of setting the strainer basket concentrically creates a fluctuating flow of liquids in regard to flow needs, thus stimulating fluid-friction loss. The body is made in cast bronze, steel, semi-steel, and cast iron; the basket of perforated brass, monel, or other specified metals, as required by the service in which the unit will be used.

Seal-Cap Stamped Closures Protect Pipe and Tube Ends

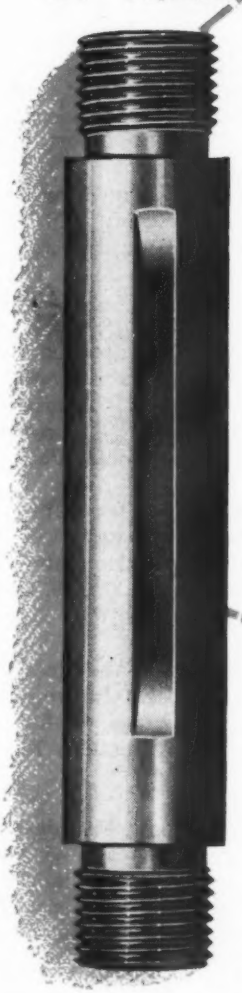
Utilizing stamping methods developed for precise production, a line of protection pipe caps and pipe plugs is manufactured by Tubing Seal-Cap, Inc., 215 West Seventh St., Los Angeles, Calif.

Threading or embossing is achieved by a process that eliminates machining and secondary operations and results in the stamping of precision plugs and caps for pipe protection and of other small parts with continuous threads.

Available at present are protecting pipe plugs and caps with NPT threads in sizes up to 1 in., fabricated from steel or aluminum, as desired.

with **SHEFFIELD**
Semiautomatic Crushing

290
of these



GROUND ACCURATELY WITH ONE WHEEL DRESSING

Sheffield's semiautomatic crushing device with motorized feed brings new advantages to the use of crush dressing.

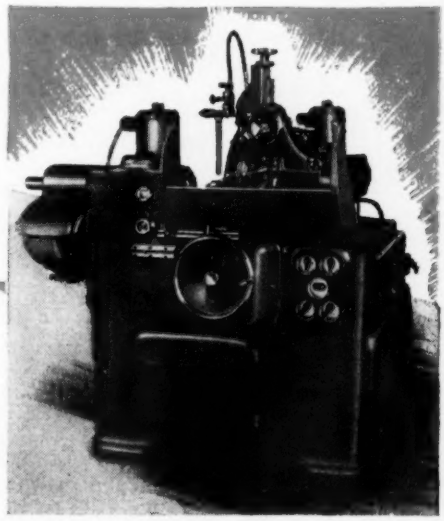
The human element of irregular rate of feeding crusher into the wheel is eliminated. Each dressing operation is uniform.

Crushing is semiautomatic and is done in half the time of manual crushing.

The life of both crusher rolls and grinding wheels is substantially increased because of uniform rate of infeed and pressure.

A typical case history of the advantages of the motorized crusher is illustrated at the left—290 thread elements were plunge ground between wheel dressings on these stainless steel ordnance parts. Threads are 5/8"-18 N.F. 3 having a length of .563". Grinding time, 20 seconds per thread element. Plunge grinding was performed on a Sheffield Thread and Form Grinder.

Write for Bulletin M-100-145.



CHEK WITH SHEFFIELD

Headquarters for crush dressing thread and form grinding equipment

THE SHEFFIELD CORPORATION
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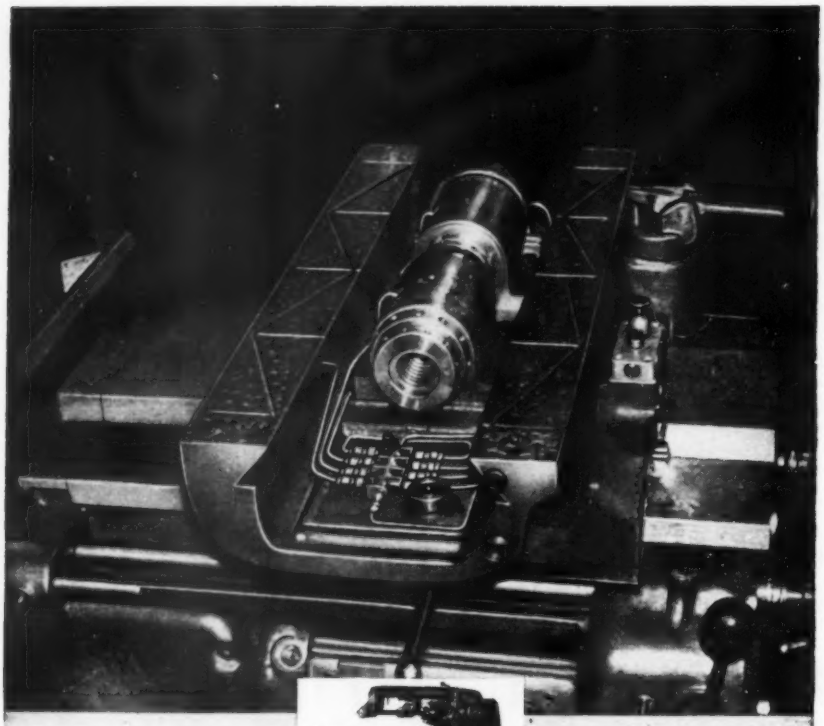

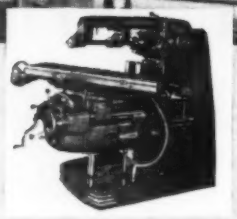

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TRADE PUBLICATIONS

Conveyors—Bulletin No. 462 containing specifications of Rex apron and pan feeders and conveyors, with capacity tables. Chain Belt Co., 1600 W. Bruce St., Milwaukee 4, Wis.

Conveyors—Illustrated folder with detailed information on gravity and power conveyors and dispatching systems. Standard Conveyor Co., North St. Paul, Minn.

Drills—Hercules twist and watchmakers' drills are listed in a circular containing details of both types from 0.150 to 1 in. diameter. Whitman & Barnes, Detroit 16, Mich.

Electrical Fittings—A 32-page catalog illustrates and describes multicontact plugs and sockets, terminal strips and fuse mountings. Howard B. Jones Co., 2460 W. George St., Chicago 18, Ill.

Gear Cutting—Illustrated booklet of Red Wing gear-cutting and finishing tools. National Broach and Machine Co., 5600 St. Jean, Detroit, Mich.

Grinding—A grinding-wheel data book of 120 pages containing detailed specifications and information. Abrasive Company, Tacony and Fraley Sts., Philadelphia, Pa.

Heat-Treatment—A booklet of 26 pages on the heat-treatment of steel and products of the Houghton line. E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.

Layout Paint—Pamphlet describing the Transfax process for reproducing working drawings on flat surfaces. Eastman Kodak Co., Rochester 4, N. Y.

Machinery—Catalog 452 describes industrial, mining and moving machinery, winches and specialized industrial products from tourist camp stoves to 15-ton castings. Lake Shore Engineering Co., Iron Mountain, Mich.

Machine Tools—Illustrated folder with pointers on broaching, grinding and indexing machines and methods. Cincinnati Milling and Grinding Machines, Inc., Cincinnati, Ohio.

Metal Spraying—Bound volume of issues of "Metco News," August, 1940 to October, 1944, covering developments and applications of the

Whatever your needs may be, there's an available magnesium form for every standard purpose. Like other firms throughout the country, you'll find it pays to adapt magnesium's lightness, strength, machinability to the job of cutting costs and improving products in your own field.

Today magnesium alloys are freely available in all common forms—ingots and billets; sand, permanent mold, and die castings; forgings; extruded bars, rods, shapes, and tubing; and rolled sheet, plate, and strip. Commercially pure magnesium and such special products as welding rod, protective agents, fluxes, and special alloys are also readily available. As the pioneer producer and leading fabricator, Dow offers complete technical data and assistance in working and fabricating magnesium. Simply contact the nearest Dow office.

Ready... to make products move!

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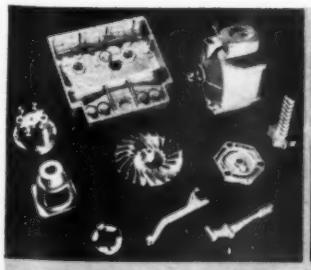
LIGHTEST OF ALL STRUCTURAL METALS



Die casting magnesium is an accepted method of producing lightweight parts with good surfaces and close dimensional tolerances.

Preheated magnesium sheet is readily deep drawn in a single operation, without need for repeated annealing and redrawing.

Sand and permanent mold castings of magnesium are known for their exceptional combination of lightness, soundness, strength.

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Any dimension between ¼" and 9" can be set to micrometer accuracy with the Lufkin Master Planer Gage for accurate setting of cutting tools of planers, shapers, and many other machine tools. The Lufkin Master Planer Gage can also be used with gage blocks in setting up work on surface plate, with indicator for transferring measurements, with sine bar in grinding angles, as an adjustable parallel, and in numerous other machining and gaging operations. All measuring surfaces of gage, including slide and 3" extension, are precisely ground to insure accuracy. The best work deserves the best tools—buy Lufkin Master Planer Gages and other superior Lufkin tools from your dealer. For free catalog write THE LUFKIN RULE CO., SAGINAW, MICHIGAN, New York City.

LUFKIN FOR ACCURACY

metal-spraying process. Metallizing Engineering Co., Inc., 21-07 41st Ave., Long Island City 1, N. Y.

Oil Strainers—Folder on Metex oil strainers for use on machine tools. George Butler Co., 1015 W. Washington Blvd., Chicago 7, Ill.

Punches and Dies—A catalog of punches and dies available in sizes from 1/8 to 3 1/8-in., in increments of 1/64-in. Wiedemann Machine Co., 189 Sedgeley Ave., Philadelphia 32, Pa.

Scales—Kron springless dial scales described in a 78-page booklet, with capacities and other details. The Yale & Towne Mfg. Co., Philadelphia 24, Pa.

Screw Threads—Booklet "Threads," covering tools and machines for the production of screw threads. The Geometric Tool Co., New Haven 15, Conn.

Silver Solder—Catalog C-11 contains listings and illustrations of silver solder backed contacts in Gibsiloy and silver for brazing. Gibson Electric Co., 8350 Frankstown Ave., Pittsburgh 21, Pa.

Snap Gages—Tubular steel adjustable limit snap gages, with details of sizes and ranges in a four-page folder. Tubular Micrometer Co., St. James, Minn.

Tanks—Illustrated folder describing glass tanks for hot acids, electroplating, dyes, foods and other uses. Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh 19, Pa.

Tools—Folder describing "Snap-Lock" plier wrenches and their applications. Seymour Smith & Son Inc., Oakville, Conn.

Tool Steels—Catalog of carbon and high-speed drill rods and cold-drawn tool steels. Allegheny Ludlum Steel Corp., Brackenridge, Pa.

V-Belts—12-page illustrated catalog No. B6051E is an engineering summary which covers Texrope drive and Magic-Grip sheave, designed for fast, easy mounting and dismounting. Handy charts, tables and drawings aid in selection of correct drive. Allis-Chalmers Mfg. Co., 1941 Ristow St., Milwaukee, Wis.

Washing Machine—Bulletin No. 19 describes the Tabl-Spray washing machine for fragile or intricate parts. American Foundry Equip-

ment Co., 555 S. Byrkit St., Mishawaka, Ind.

Welding and Cutting—A 104-page illustrated catalog of gas-welding and cutting equipment and accessories, with detailed specifications. Victor Equipment Co., 844 Folsom St., San Francisco, Calif.

Welding Equipment—Illustrated folder of welding units for production purposes. Thomson-Gibb Electric Welding Co., Lynn, Mass.

NEW BOOKS

TIME STUDY AND MOTION ECONOMY FOR SUPERVISORS. *By James D. Shevlin. 73 pages. Published by the National Foremen's Institute, Inc., Deep River, Conn. Price $2.*

The place of the foreman in time study and motion study is brought out in this explanation of the objectives and methods for carrying out these steps in improving production methods. The book describes in brief, but clear, fashion the major steps in time and motion study, pointing out that the Manual is not designed for time-study engineers but for foremen. However, it stresses the importance of the foreman's appreciation of the reasons for such studies, in order to help him eliminate grievances. At the same time, the spreading adoption of incentive plans has made their explanation to the workers the foreman's responsibility, as well as that of the time-study department. As the foreman usually has to put his OK on such time studies, he must make sure that it satisfies him before new standards are developed as a result of such studies. Illustrated with explanatory charts and sample filled-out time- and motion-study sheets, the book should prove helpful to foremen "who have open minds when it comes to making products easier, safer and better."

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INDUSTRIAL ORGANIZATION AND MANAGEMENT. *A text in the McGraw-Hill Industrial Organization and Management Series—Prepared by Lawrence L. Bethel, director, New Haven Y.M.C.A. Junior College; Franklin S. Atwater, production engineer, Fafnir Bearing Company; George H. E. Smith, lawyer and economist, and Harvey A. Stackman, Jr., personnel administrator,*

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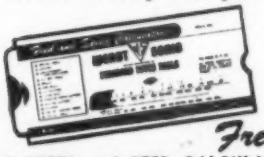
- **NOW YOU CAN HANDLE 3 OUT OF 4** step milling and ordinary milling jobs with this one cutter.
- **IMPROVED BLADE DESIGN** requires *less* horsepower than ordinary cutters.
- **BLADES ARE STANDARDIZED** and stocked by W-S Distributors. Resharpen on bench grinder.
- **REFER TO "TOOLS"** in your Classified Directory for local W-S Distributor or write Wendt-Sonis Company, Hannibal, Missouri. Branch Warehouse: Long Beach, California.



Free!

W-S SPEED and FEED CALCULATOR for Carbide Cutters—Gives correct feed per tooth per r.p.m. Also gives basic rough and finish cuts for all materials. Write on business letterhead for your FREE Wendt-Sonis Calculator.

W-S FACTORY TRAINING COURSE, *FREE!* One week's intensive training, at our factory, in application, use and maintenance of carbide cutting tools. Small classes, individual instruction. Practical facts, actual shop practice. Write for details.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

Scovill Mfg. Company. 798 pages. Published by the McGraw-Hill Book Company, 330 West 42 St., New York 18, N. Y. $4.50.

This book deals with the principles of management which are universally applicable to industrial enterprises, and regardless of whether they employ few or many workers. Because of this circumstance, the book is of interest to at least three classes of people: First, the student of industrial management in college, extension or work-study training. Second, professional engineers, lawyers, accountants who must possess a working knowledge of fundamental management principles. Third, practitioners of industrial management may review basic management principles in order to gain a better perspective.

To serve these purposes, each chapter is composed of four parts: (1) brief statement of fundamentals and operating principles related to the function in question; (2) case examples, (3) consideration of controversial issues of the present and a tentative view of the outlook, and (4) case problems and questions adapted from actual plant situations. The material for this book has been developed and used by the authors in classes over the past three years.

SEEN and HEARD

By JOHN R. GODFREY

Improvise and Compromise

A SPECIAL 32-page section of the London *Times* pays a fine tribute to British war production. There is no question that Great Britain did its job under difficult circumstances.

Not to get into any "who-won-it" controversy, there is one paragraph in this section that calls for rebuttal:

"It has been said that if at Dunkirk the positions of American and Britain had been reversed, the war might very well have been lost by the Allies. For the United States with its Willow Run and West Coast shipyards, planned in the grand style, needed many months to get tooled up for production. Britain's long experience as the workshop of the world stood her in better stead and made rapid improvisation easier. A great part of our industrial potential could be switched almost overnight from peace to war work. It was improvise or capitulate, and by our good fortune improvisation is

to the British factory man as compromise is to the British politician.

It might be pointed out that Willow Run was not typical of U. S. war output, that B-24 bombers were being produced in other U. S. plants two years before Willow Run started to turn them out. In fact the United States did not rely on specially tooled high-production plants to get into wartime manufacture but used them to supply volume, backing up other units which got to work quickly. Subcontracting and improvisation were used extensively in the United States during the war. They are still used. And compromising politicians are not an exclusive British product either.

Why They Used Coolants

IN MOST CASES where coolant is used in cutting, it is advisable to have it flood the work, volume being more important than pressure, even in boring operations. One trepanning job uses over 250 g.p.m. at 50-lb. pressure, instead of a higher pressure. A recent shop visit disclosed only a small stream on the tool with a 9/16-in. cut at 250 s.f.p.m. The explanation was that they would prefer to run the cut dry, but scale from the forging got on the ways of the lathe and scored them. The coolant prevented their accumulation on the lathe bed.

Don't Overlook Temperature

Temperature plays such an important part in all machining operations that it should not be overlooked as a possible cause of unsatisfactory results in any kind of work. Its particular effect upon finishing operations indicates that temperature is more likely to cause trouble in grinding operations than in turning.

One source of trouble often traces to the cooling liquid used. Sufficient water in the solution is essential. Grinding experts frequently find that coolants are too thick or insufficiently diluted, thus creating more heat as grinding proceeds. While this is true of other work, variations are more predominant in internal and external grinding.

The Lightest Material

MAGNESIUM, among the newest structural materials, is used in products by 17 percent of 551 plants recently surveyed. Thirty-two percent plan increased applications. Of those not now using magnesium, 11 percent expect to use it. The principal metal to be replaced is aluminum.

You can draw on 70 Years of TAFT-PEIRCE Experience

IN TOOLING AND PRODUCING

At one time or another, every basic industry has been served by The Taft-Peirce Contract Division in one or all of its phases: Engineering, design, redesign, model-building, tooling, building of special machines or parts, and finally the production of any quantity, large or small, of parts or complete mechanisms and products. Come V-J Day, all this varied experience will be at your service again, implemented as always by the top-grade men and machines traditionally associated with The Taft-Peirce Manufacturing Company of Woonsocket, Rhode Island. Many departments have available capacity at present. Preliminary arrangements may be discussed now, if you like, so that you may satisfy yourself as to what so many industrialists mean when, *speaking frankly out of their own experience,* they give you this advice:

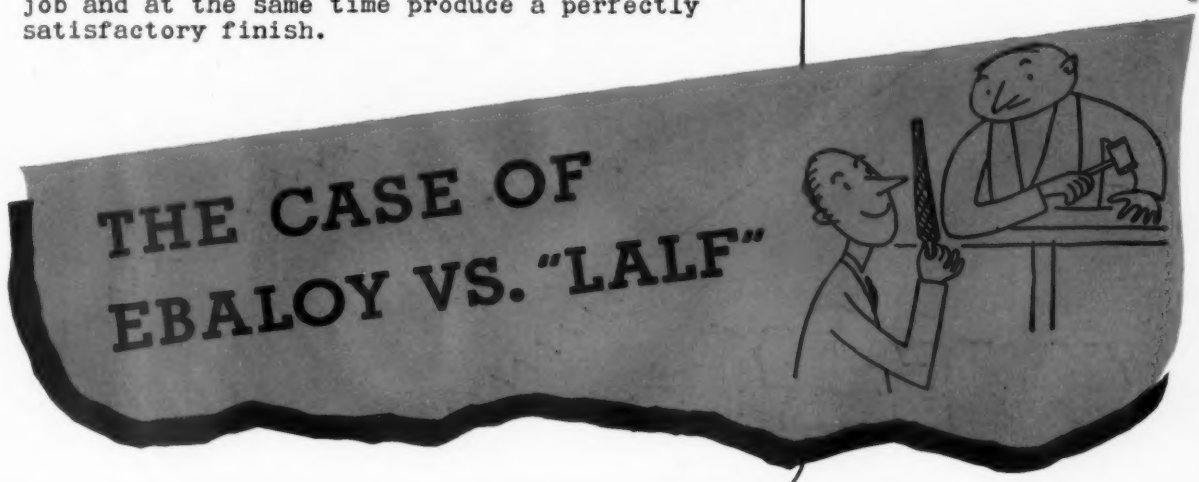
For Design, Tooling, Contract Manufacturing . . .

TAKE IT TO TAFT-PEIRCE

Case history No. 187

Ebaloy is a tough alloy steel. "LALF" stands for Long Angle Lathe File. The two came to grips in a valve-manufacturing plant. In perhaps ninety cases out of a hundred this file will do a perfect job of lathe filing. But in this particular instance it didn't . . . it simply would not polish out Ebaloy valve stems smoothly.

A Nicholson service engineer had the solution. One way to do the job right, he explained, was to use the Long Angle Lathe File to remove the tool marks and then polish with a Mill Smooth File. A still better way, said he, was to use a Mill Second Cut* for the whole operation . . . because it could do a faster cutting job and at the same time produce a perfectly satisfactory finish.



NEW METALS, new products, new production methods are constantly creating new filing problems. It has long been a Nicholson policy to serve industry not only by making *Files for every purpose*, but to assist in selecting *The right file for the job.*

Another service that Nicholson feels it owes its customers is to contribute toward the proper use and care of files. This guidance is offered in the interest of more efficient workmanship, greater production and lower tool costs. One of the most helpful aids in the use of files is—

●

"FILE FILOSOPHY"—the interesting, profusely illustrated Nicholson 48-page handbook on kinds, use and care of files. It is FREE to industrial managements in quantities for judicious distribution around the shop, tool room and among production and purchasing heads. . . . And order Nicholson files from your mill-supply house.

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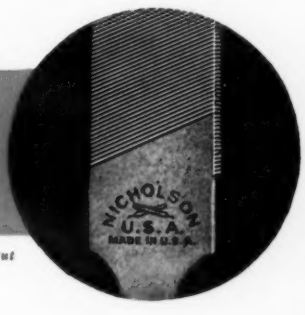
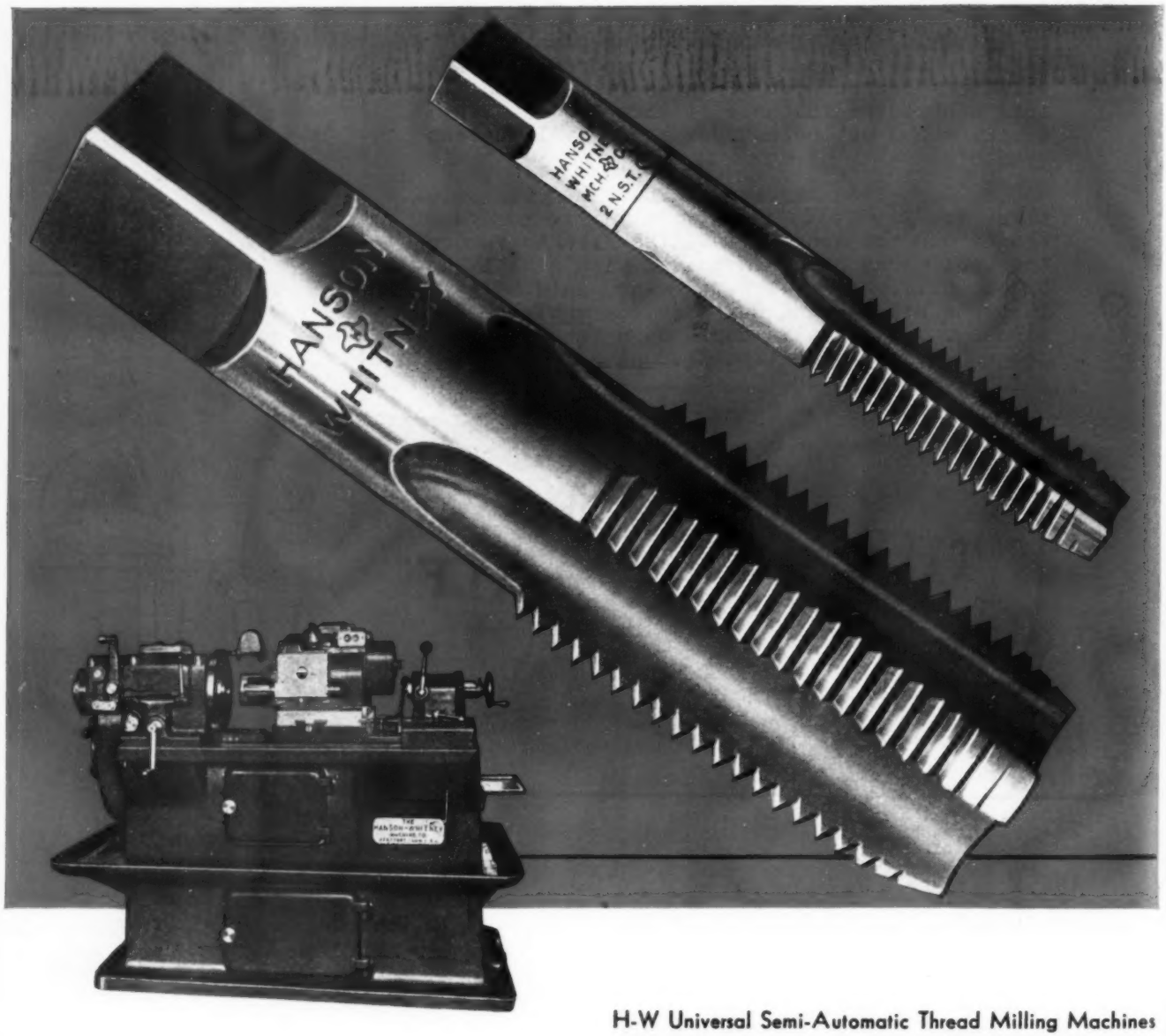
NICHOLSON FILES
FOR EVERY PURPOSE



*Nicholson Mill Second Cut

F R O M W A R

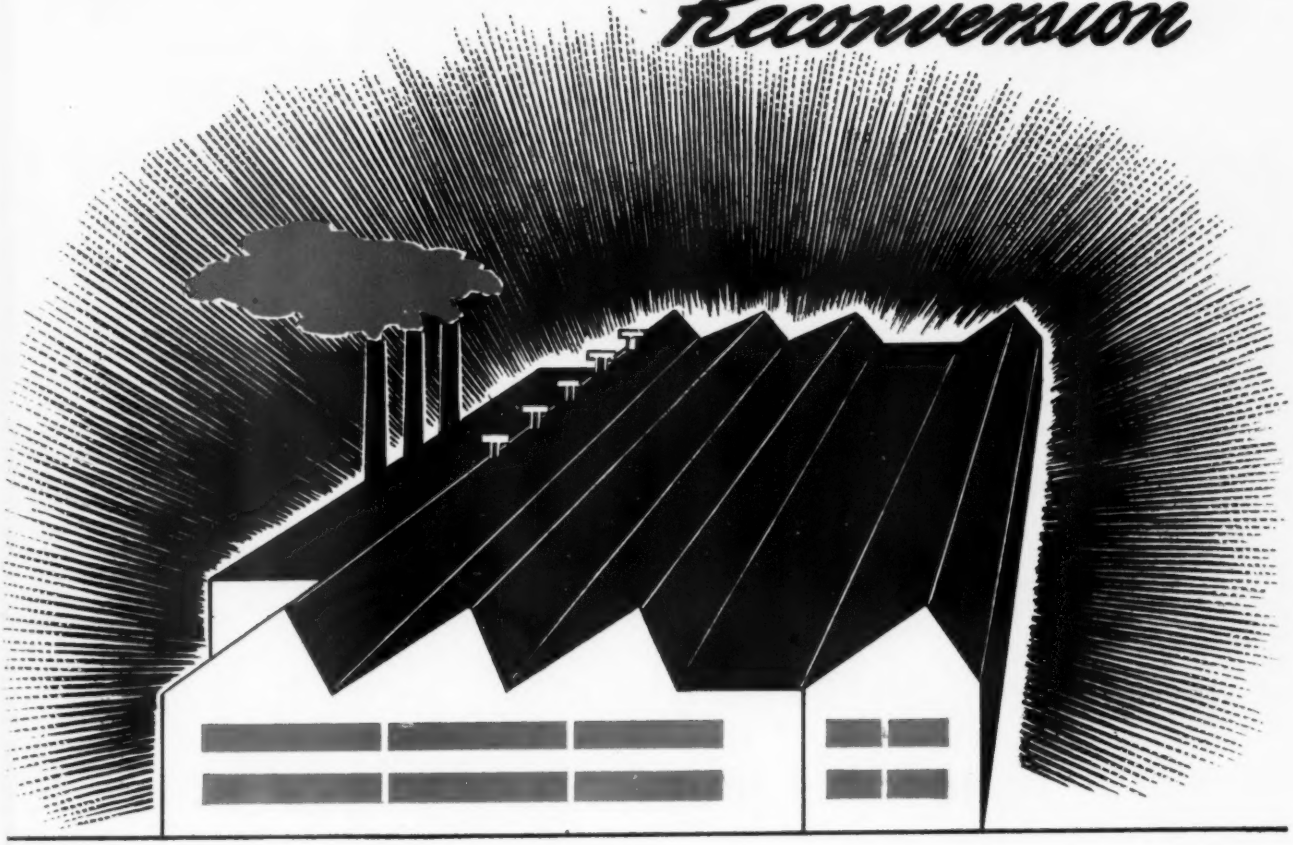


H-W Universal Semi-Automatic Thread Milling Machines will play an important part in building for Peace . . . as they are today in producing the tools of War. The H-W Milling Process permits the working of many previously difficult materials . . . and, by applying the multiple-cutter principle, threads of all lengths within the capacity of the machine are completed in one revolution. External, internal and taper threads . . . right or left hand . . . can be cut with equal speed, precision and facility.

H-W Taps . . . made by the exclusive "Hanson Process" of finishing after hardening which insures uniform grain structure throughout . . . will deliver longer, more accurate runs between grinds, minimize down time, reduce rejects. If you have a thread milling or tapping problem, write or wire . . .

TO PEACE

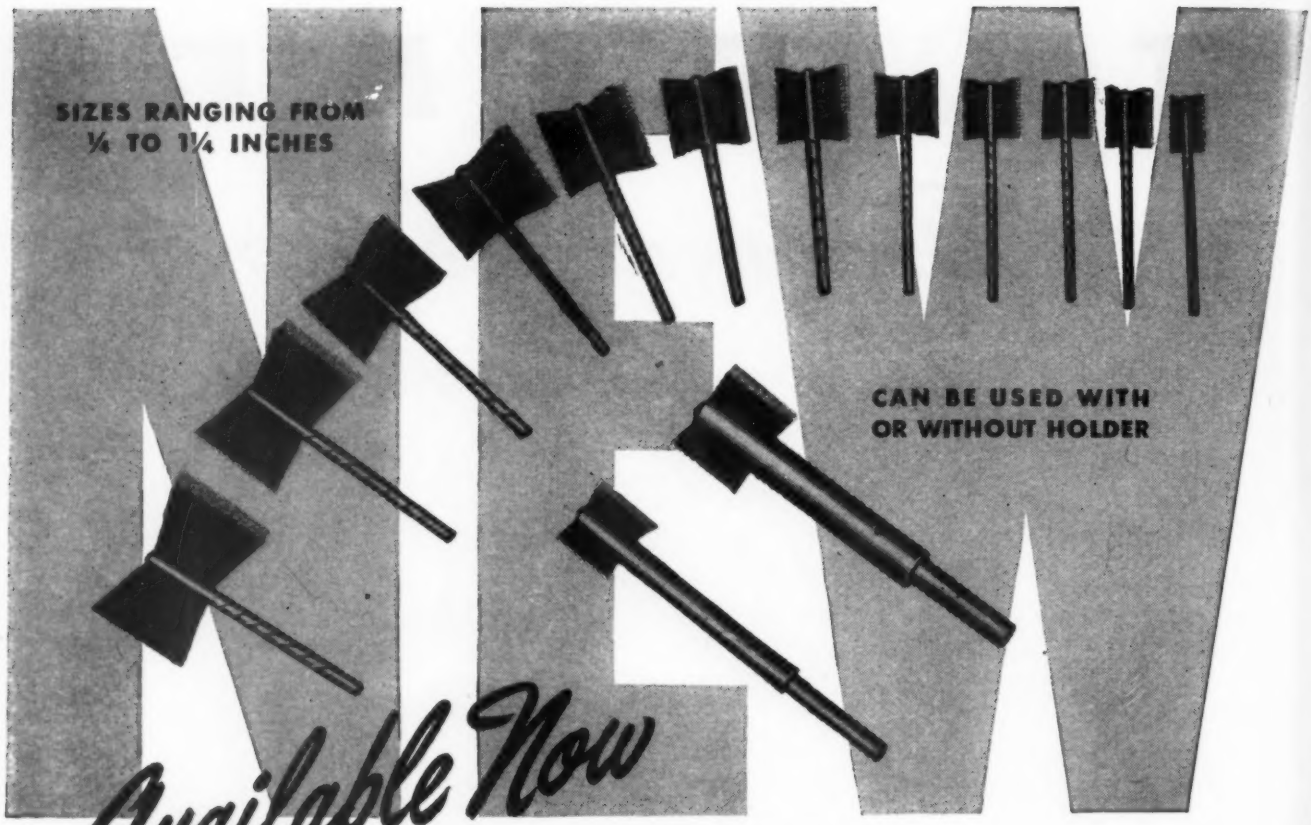
Bridging the Gap to Reconversion



Hanson Whitney

MACHINE COMPANY

HARTFORD • CONNECTICUT



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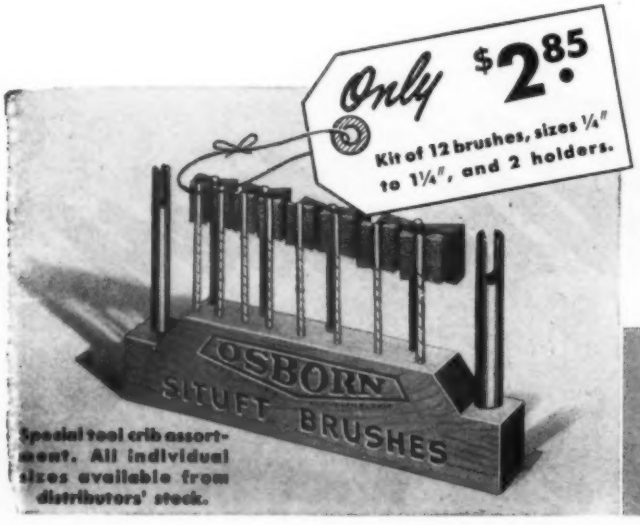
FROM LOCAL DISTRIBUTOR

Osborn's new miracle brush...THE "SITUFT"... used for thousands of small, hard-to-get-at, formerly impossible jobs...COSTS LESS THAN 20c

For deburring... scale removal... thread cleaning... removing rust, corrosion and foreign matter, etc., from hard-to-reach places. Can be used on any high speed drill press, portable tool or bench grinder.



Special tool crib assortment. All individual sizes available from distributors' stock.

THE SITUFT was developed by Osborn in the last days of the war and it literally performed miracles of production. *Tested by 36 manufacturers in unrelated industries* . . . the "Situft" showed production increases as high as 600%, with costs lowered proportionately. It's 1000 to 1 it can do a similar job on your product. Order your special tool crib assortment NOW!

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5401 Hamilton Ave. *Cleveland, Ohio*

Osborn Brushes

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

Remember these

FREE-MACHINING MONELS

as your source of STRONG, TOUGH, RUST-PROOF screw stock

"R" MONEL

...for parts not to be hardened by heat treatment

Here's a specially developed grade of Monel you can use in making parts on high-speed automatic screw machines. Aside from its free-cutting characteristics, "R" MONEL provides practically the same mechanical properties and corrosion resistance that have made regular Monel so valuable. Its strength is equal to that of the best steel screw stock.

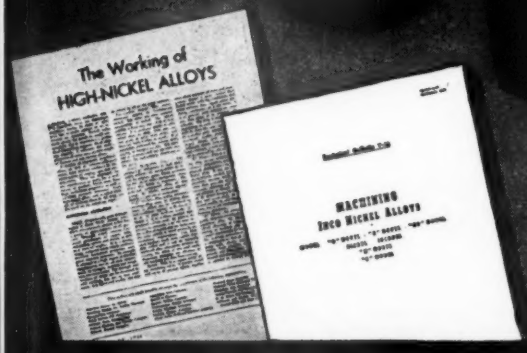
COLD-DRAWN OR HOT-ROLLED
ROUNDS • SQUARES • HEXAGONS

"KR" MONEL

...for parts to be hardened by heat treatment

"K" Monel has long been known for its great strength and hardness. Now you have its machinable brother, "KR" MONEL, to use for screw machine parts where a heat-hardenable material is needed to withstand heavy loads. "KR" is your best bet for corrosion resisting parts that must be made extra hard and strong through heat treatment.

FREE-MACHINING "R" AND "KR" MONELS
CAN SAVE YOU TIME AND MONEY!



MACHINING TECHNIQUES for both "R" and "KR" Monel are clearly and fully described in Machining Bulletin T-12. Write for your copy. Handy, too, is the reprint, *"The Working of High-Nickel Alloys."*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Gentlemen: Please send me
☐ a copy of Machining Bulletin T-12
☐ a copy of "The Working of High-Nickel Alloys"

Name.....

Duties.....*Title*.....

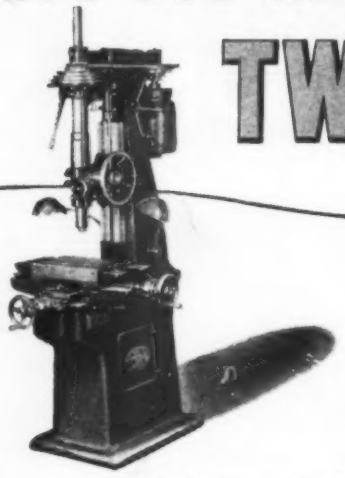
A.M. 11-22-45

Company.....

Address.....

Have You All the Information You Need?

TWO RETOOLING MUSTS

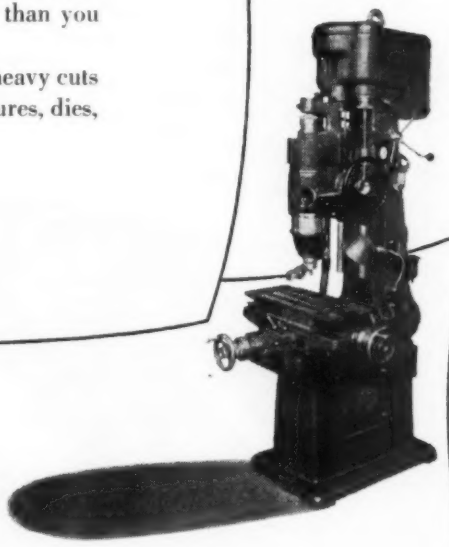


Spots...Drills...Bores or Reams
All Holes In a Workpiece
With Minimum Tool Changes

With the Moore Jig Borer, there's less stop-and-start to change tools at individual holes for each operation, because there are no size blocks or end measures to labor over. *Built-in* lead screws, accurate to .0002" over 14" of travel, enable you to make table settings faster than you can change tools.*

Highly sensitive for holes 1/32" diameter, yet rugged for heavy cuts up to 4½", the Moore Jig Borer is ideally suited for jigs, fixtures, dies, machine parts and jig-less, small lot production.

MOORE JIG BORER



Mechanically Relocates and Finish-Grinds
Holes in Hardened Parts to .0001"
in ⅓ The Time of Other Methods

The Moore Jig Grinder eliminates hours of checking on the bench and surface plate to correct holes in hardened parts. No toolmaker's buttons or locating plugs are necessary, for this unique machine through the use of *built-in* lead screws *mechanically* relocates and finish-grinds straight or tapered holes in ⅓ to ¼ the time required by conventional methods.*

Working to figures instead of to "fit," the Moore Jig Grinder puts die making on an interchangeable parts and assembly basis for the first time. Die, stripper and punch plates can now be produced concurrently with better alignment of mating parts and more uniform clearance between punch and die.

MOORE JIG GRINDER

Write today for descriptive literature

MOORE TOOLS

MOORE SPECIAL TOOL COMPANY, INC.

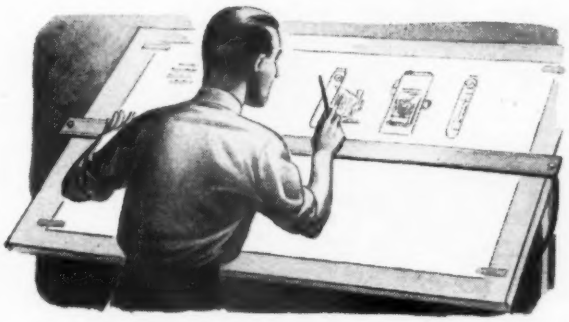
738 UNION AVENUE • BRIDGEPORT 7, CONNECTICUT

TROUBLES SUBSIDE

It was a slow and troublesome job to drive small slotted screws in fastening a pressed fabric panel on this electrical relay for the P-80 Jet Plane. Frequent driver skids gouged the special fungus-resistant varnish, forced disassembly and junking of marred panels.

OUTPUT HITS STRIDE

Assembly of this part was speeded up 400% when a change was made to Phillips Recessed Head Screws. Fumbling was ended, and a spiral driver could be used, permitting faster driving. Driver skids were eliminated, along with waste of parts and time for disassembly and reassembly.



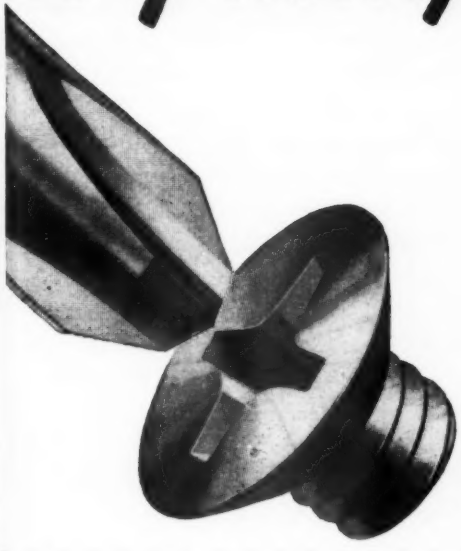
NEW STRENGTH SUPPLIED

Design engineers favor Phillips Screws, because they not only speed output and reduce costs . . . they also permit design improvements that add strength, often with the use of fewer screws. This advantage is especially evident in compact, complicated assemblies.

SHOW IT WITH PRIDE

Wherever screw heads are exposed, the Phillips Recess adds a sales advantage. No unsightly burrs to snag clothing or nick fingers – and sidetrack sales! Its ornamental design blends with modern contours – and it needs only a quarter turn to line up – looks well in any position.

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

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friction insurance

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DURING almost half a century, BCA Ball Bearings have been reducing friction... providing smooth, dependable machine performance... for leading manufacturers. Now, once more, these bearings are available on a normal delivery basis.

Equipment makers and equipment users have both found that they reduce equipment maintenance when they specify BCA. They have learned that BCA Ball Bearings are engineered to provide an ample margin of safety for specified shocks, loads and thrusts. That's why you will benefit by discussing your needs with BCA—whether you need radial, thrust or angular contact ball bearings.

BEARINGS COMPANY OF AMERICA
LANCASTER, PENNA.

BCA

RADIAL • ANGULAR CONTACT • THRUST

BALL BEARINGS

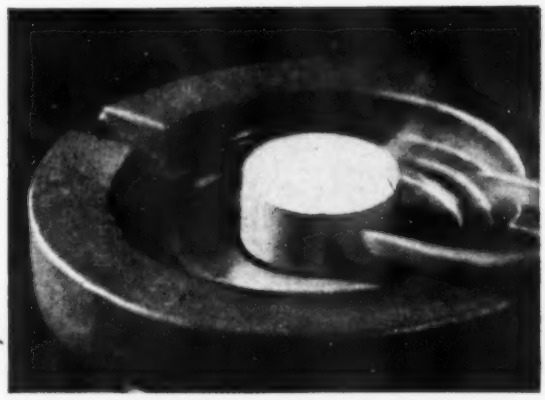
Anaconda HOT PRESSED FORGINGS
made by The American Brass Company

Illustrating the almost unlimited design possibilities in producing complicated or intricate parts of wrought Copper, Brass, Bronze or Special Copper Alloys. Additional information regarding this product appears on the following page.

Machined samples through courtesy of customers.

Here's how Anaconda Hot Pressed Forgings are made

1
a heated copper-alloy blank is centered in the die . . .



2
the dies close—with hundreds of tons of pressure . . .

3
and presto! — the metal is wrought into a semi-finished shape.

Of course, it isn't quite that simple. There are such matters as alloy composition, forging temperature, die design, trimming, piercing or sizing — but these are problems that we take care of.

and here's how they improve the product, reduce the cost

Anaconda Hot Pressed Forgings have twice the strength of sand castings—without the sand that causes needless tool wear. Absence of internal defects and a uniform, dense grain structure make them gas, air and watertight—able to withstand high pressures. Consistently accurate in dimension, they have a smooth, fine-textured surface and machine readily. Available in Copper, Brass, Bronze and Special Copper Alloys.

For typical examples of Anaconda Hot Pressed Forgings, see the preceding page. Inquiries regarding specific metallurgical, design, cost or production information will be given prompt attention. 45161

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
Subsidiary of Anaconda Copper Mining Company
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ANACONDA *Anaconda Hot Pressed Forgings*

Now that Tungsten high-speed steel can be supplied as needed, manufacturers are returning to it for the well-defined uses in which it surpasses all other materials.

Very rapidly, since Government restrictions began to abate, the volume of Tungsten going for civilian requirements has increased month by month. An informative book, entitled "Tungsten Steels," has been prepared by the Molybdenum Corporation. It deals with both scientific and practical considerations, and recommends procedures that have been found to yield best results. A copy of this publication will be mailed on request. Correspondence is invited concerning any application of Molybdenum, Tungsten, or Boron.

AMERICAN Production, American Distribution, American Control—Completely Integrated.
Offices: Pittsburgh, New York, Chicago, Detroit, Los Angeles, San Francisco, Seattle.
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MCA

Broken Lines...
always a Production Headache

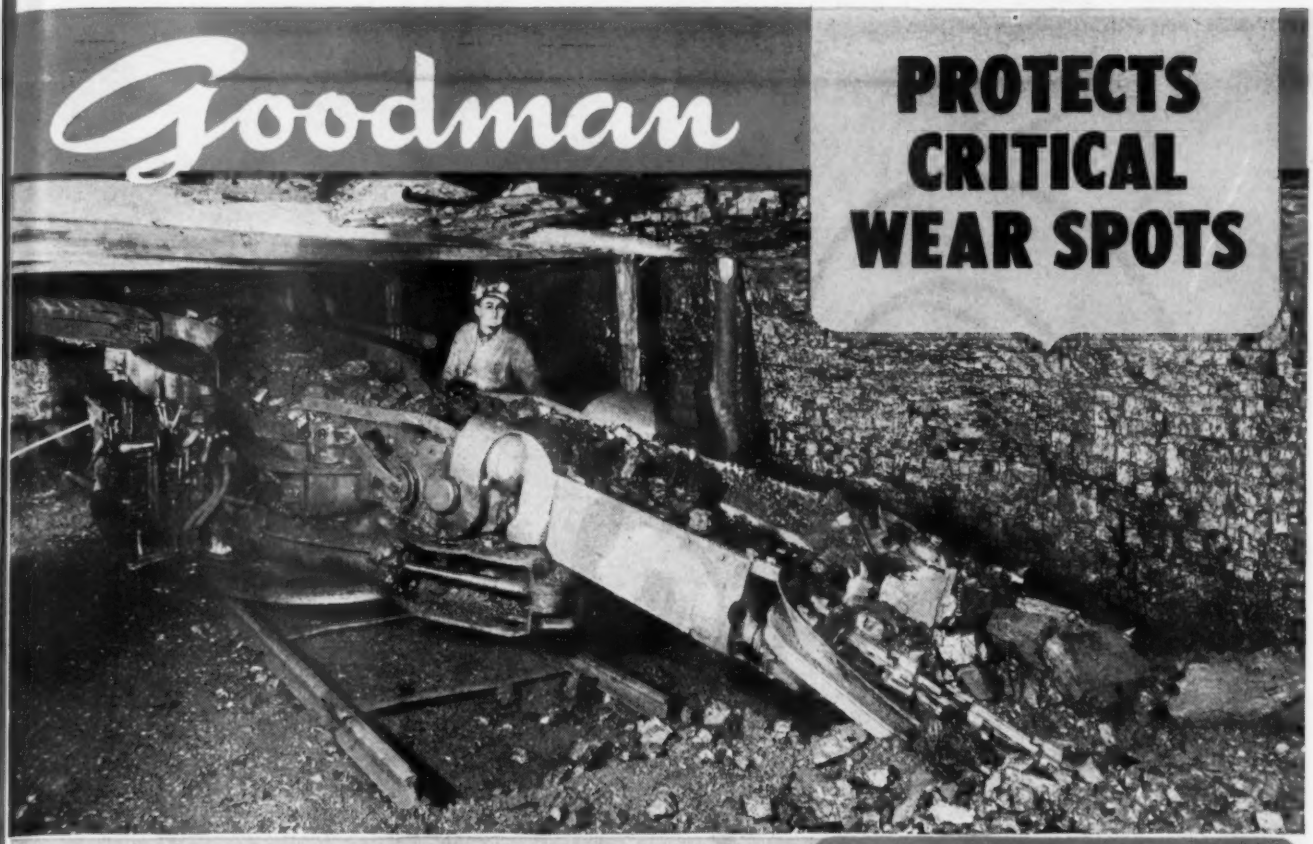
In cost-conscious peace-time production, "down" machines and equipment can not be tolerated. Broken flexible lines—leaking connections... these are causes of production slow-downs that need not be tolerated. For conveying oil, cutting compounds, gas, or acids, Titeflex can eliminate costly breakdowns. Lines that leak from corrosion, flexing or destructive vibration are a thing of the past in plants which have adopted Titeflex...the all-metal flexible tubing which is not damaged by extreme pressures, by oils, or most types of liquids.

If you have a problem in handling the flow of gas or liquid that is giving you a headache, we suggest passing your trouble on to Titeflex Application Engineers. Just write Titeflex, Inc., 535 Frelinghuysen Avenue, Newark 5, New Jersey. Catalog #113 available on request.

Titeflex

The all-metal flexible tubing that stays tight

Goodman PROTECTS CRITICAL WEAR SPOTS



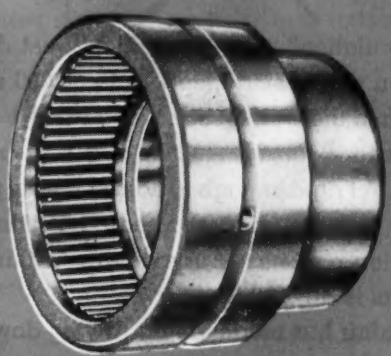
Orange Roller Bushings in two clutches and main transmission help this Goodman Track-Mounted Loader maintain a consistently high loading rate.

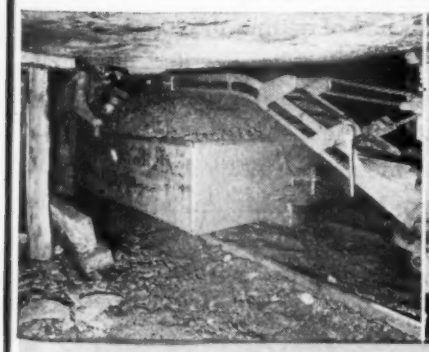
WITH ORANGE ROLLER BUSHINGS

It's no easy matter to make replacements and repairs on underground mining equipment. That's why Goodman Mfg. Co. emphasizes trouble-freedom in building its mining machinery and selecting parts for it. That Orange Roller Bushings meet these strict standards in the transmissions, planetaries and conveyor shafts is confirmed by Goodman's report—"trouble-free service over long periods of time."

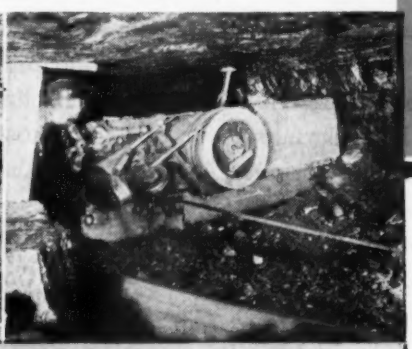
The smooth, quiet, long life operation that characterizes Orange Roller Bushings under severe loads and gruelling conditions, is due to their closer internal running clearances which keep the rollers in alignment with the highly finished raceways. Maintaining dimensional uniformity of rollers to extremely close tolerances makes this construction possible. Write for the complete engineering data book showing designs, sizes, capacities, installation data, etc.

ORANGE ROLLER BEARING CO., Inc. 554 Main St. Orange, N. J.





Orange Roller Bushings prevent wear on the drive and driven shafts on the slack conveyor of the Goodman Type 724 Track-Mounted Cutting Machine.



Twelve Orange Roller Bushings take heavy shock loads in the planetaries that control the wire rope drums of this Goodman Shortwall Machine.

Mail Coupon for Engineering Data

Orange Roller Bearing Co., Inc., AM
Orange, N. J.
Please send me your Roller Bushing Data Book

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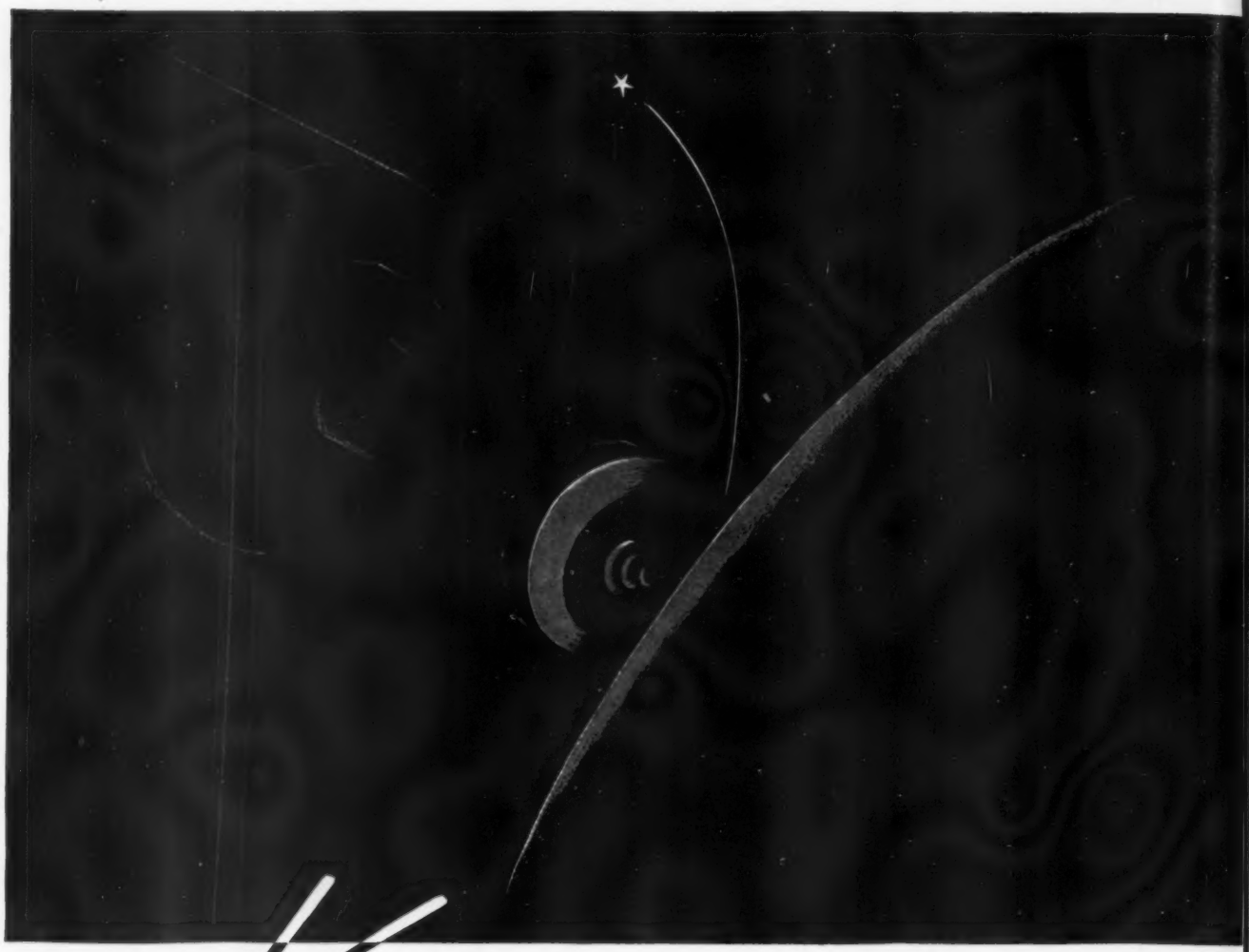
Company.....

Address .....

City..... State.....



Kissing AT 50,000 R.P.M.

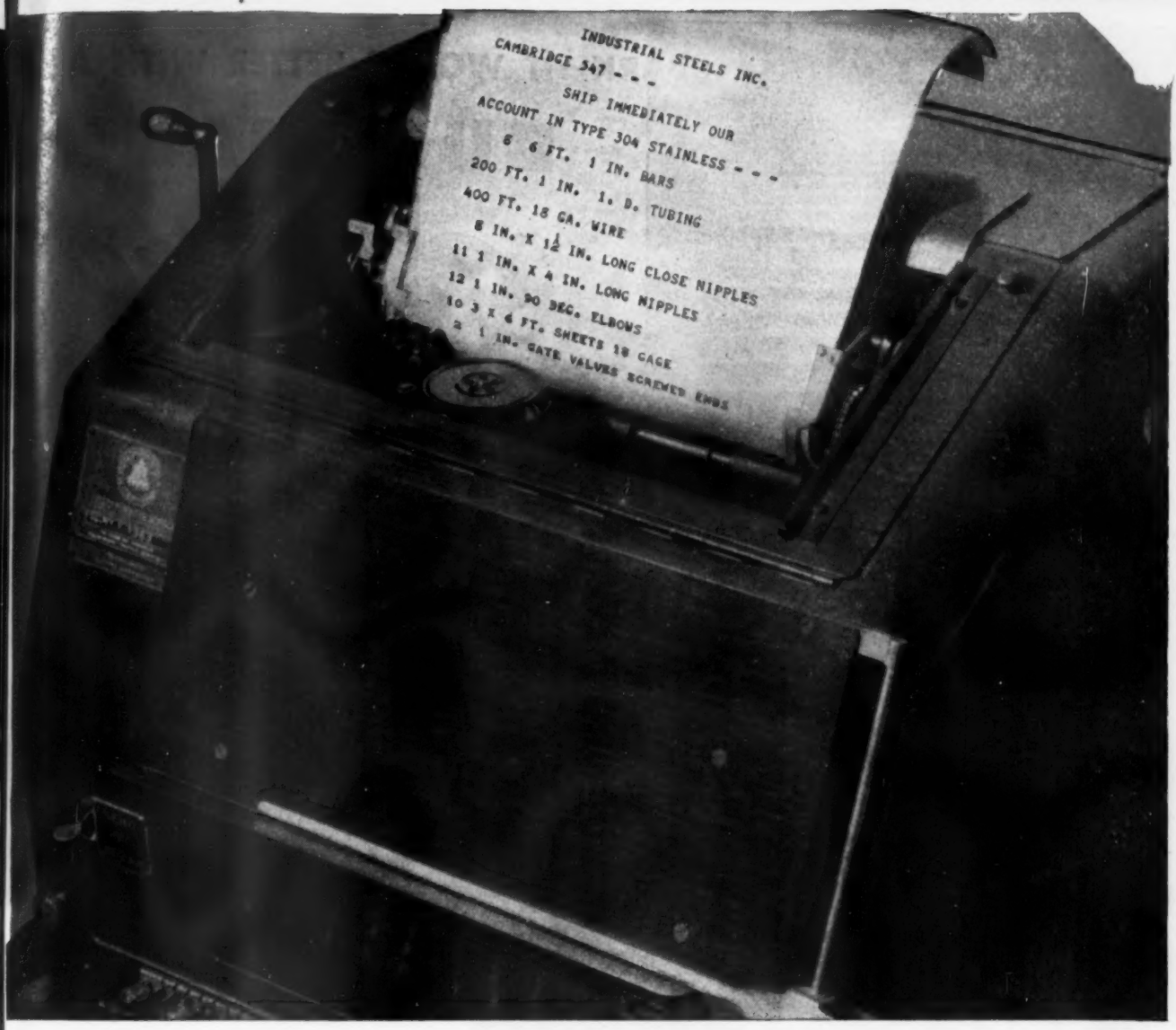
"Osculation" and "oscillation" just don't go together when the kissing steps up to 50,000 r.p.m. and better . . . and the work is measured in the ten-thousandths of an inch. Bearings must be as frictionless as possible . . . and yet rigid enough to hold accurate peripheral limits. The only bearing that can function with minimum friction and necessary rigidity within such tolerance limits is a ball bearing.

Fafnir has made the narrowing down of permissible tolerances in extreme precision types of ball bearings its special field. It's a wholly different job of bearing manufacturing. It begins with critical selection of steels and a special heat treatment, with different methods of precision race grinding, ring construction and precision preloading. Matching eccentricities of individual balls and of pairs of bearings has reduced tolerance limits to the almost incredible measurement of hundred-thousandths of an inch. At the same time, life expectancy of such bearings has been raised as high as 8000 hours, running at 50,000 r.p.m. and better.

It's the way Fafnir has of getting the focus on really tough bearing problems that has created the unique Fafnir Line . . . a line of made-to-specifications bearings . . . and the "most complete line of ball bearings in America". It's the reason so many industries have found that they save both time and money by putting bearing problems up to Fafnir first. The Fafnir Bearing Company, New Britain, Connecticut.

MOST COMPLETE LINE IN AMERICA

FAFNIR BALL BEARINGS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6 6 FT. 1 IN. BARS
200 FT. 1 IN. I. D. TUBING
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6 IN. X 1/2 IN. LONG CLOSE NIPPLES
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THE fabricator of stainless steel equipment whose order you see coming off the teletype machine . . . like many other users of Stainless shapes and parts . . . has learned that all his orders for Stainless will be filled completely and promptly from the huge warehouse stocks of INDUSTRIAL STEELS, INC.

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Now it is not necessary to place orders for Stainless with a number of suppliers. You can save time and money in ordering . . . and can avoid delays in deliveries . . . by letting one order do it all.

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BUCHMANN "Sure-fire" SPARK WHEEL

Smooth, instantaneous, unfailing action for any sparking device

For more than 35 years, the world's finest sparking devices have been built around the famous Buchmann "Sure-Fire" Spark Wheel.

Manufacturers look to Buchmann for this vital part because they know they can depend on the *consistent uniformity and precision* of Buchmann Wheels. Uniformity that cuts assembly costs and reduces rejects. Precision that means smooth, instantaneous, "sure-fire" sparking action. And Buchmann wheels give years of extra service because teeth are specially hardened by an exclusive Buchmann process.

What's more—as the world's largest manufacturer of spark wheels, Buchmann offers you a quality-price ratio that can't be equalled—either in stock sizes and types or in wheels, round and flat files machined to your specifications.

In the design and production of your sparking devices, Buchmann will be glad to share a wealth of practical knowledge gained during many years of leadership in this specialized field. If it's a cigarette lighter, mechanical mining lamp, gas lighter, sparking toy or any other product that works with a spark—*better call Buchmann!*

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4-20 47th Avenue, Long Island City 1, New York

Coming Soon!

THE AIRCO ELECTRONIC TRACING DEVICE

"ELECTRONIC BLOODHOUND"

A *NEW* AIRCO CONTRIBUTION TO MACHINE GAS CUTTING

This electronically-controlled tracing device, designed for use on Airco Oxygraph and Travograph gas cutting machines, points the way to important savings. Applied to machine gas cutting in collaboration with General Electric Company, this "Electronic Bloodhound" assures faithful reproduction with extreme accuracy.

An outline drawing or silhouette, which can be prepared easily and at low cost, is the only guide needed. One drawing or silhouette is sufficient whether one, a hundred, a thousand or more parts are to be cut. The Airco electronic tracing device follows the outline automatically to effect such accuracy of cutting that in most cases further machining is unnecessary.

An explanatory article — "Electronic Tracing Device in Machine Gas Cutting" — will be available shortly. Fill in and mail the coupon for your copy.

This specimen cut shows all possibilities that might arise when machine gas cutting steel shapes — inside and outside square corners; obtuse and acute angles; long slim projections; narrow slots . . . intricate contours, all possible with Airco's new Electronic Tracing Device.

AM-11-22-

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Please send me a copy of the article: "Electronic Tracing Device in Machine Gas Cutting"

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ORIGINATORS OF MODERN OXYACETYLENE AND ELECTRIC ARC METHODS FOR METAL FABRICATION

He was always "4-FOOTED FRED"

...always down on all fours, trying to find those slithery slotted screws that skid off the driver and roll out of sight. Fred lost hours this way—as well as scores of screws —

...until AMERICAN PHILLIPS SCREWS put him back on his feet—*and kept him there*

Every time Fred fits an American Phillips Screw on the 4-winged bit of his power driver—he's a sure shot to make a swift, straight, secure fastening. For these recessed-head screws *stay aligned* with the driver till the heads are turned up flush. There's no open-end slot to let the driver skid out... instead, a 4-winged recess that encloses the driver completely, and holds it secure in a *tapered* grip.

So no time is lost in hunting for dropped screws... and none lost in slow starts, "drunken driving," or filing mangled screwheads. For American Phillips Screws drive straight every time, and their heads can't burr or split. This means total time-savings up to 50%—*which means that American Phillips Screws COST LEAST on any assembly job.*

Make a note, now, to mark your orders: "*American* Phillips Screws." For then you get the extra value-protection of American's 4 inspections, and automatic weigh-count... plus prompt delivery from ample American warehouse stocks.

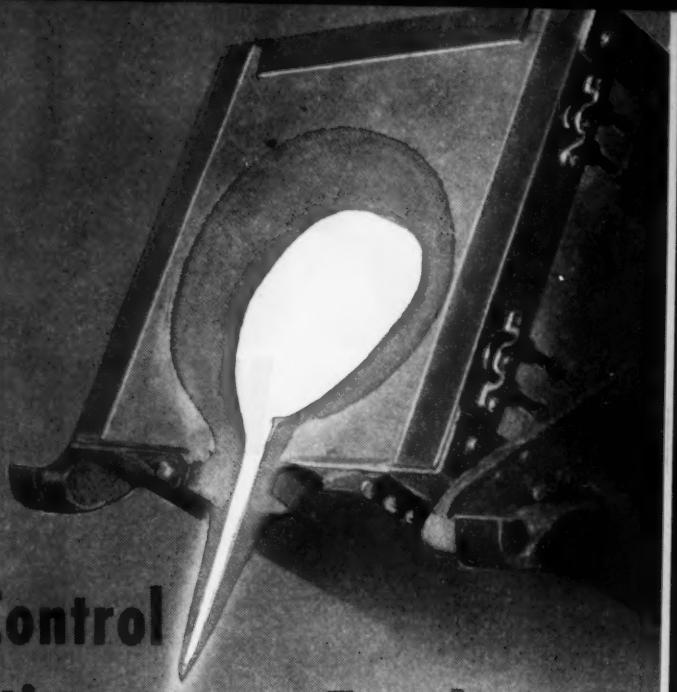
AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

Guaranteed Free from Burrs and Split Heads

The Secret of Nichrome* Superiority



Precise Metallurgical Control from Furnace to Casting

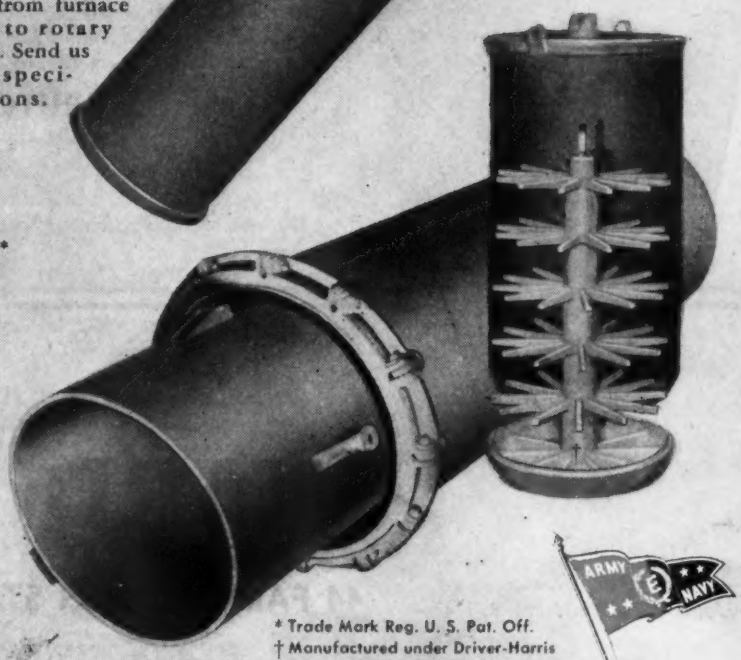
To produce genuine Nichrome takes more than the combining of the two metals, Nickel and Chromium. It requires specialized techniques to make this superior high heat and oxidation resisting alloy; the same technique essential in the production of the malleable grades of Nichrome as used in industrial and electrical appliances.

Through every stage of manufacture, from the first melting of the metals to the final machining of the finished casting, precise metallurgical checks and controls operate to assure the peerless and enduring qualities of Nichrome.

These exclusive Driver-Harris quality controls represent 45 years of continuous alloy research. No wonder, therefore, that Nichrome is the time-tested standard by which other heat-resisting alloys are measured. Although there are many excellent nickel chromium combinations, there is *only* one NICHROME—and it is made *only* by Driver-Harris.

For full technical information regarding D-H Nichrome, write for copies of the booklets entitled, *Nichrome—Chromax—Cimet* and *Work Holding Fixtures for Pit-Type Furnaces.* They will be valuable additions to your reference files.

Driver-Harris manufactures a complete line of heat-treating equipment from furnace parts to rotary retorts. Send us your specifications.



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Famous for NICHROME*

Driver-Harris COMPANY

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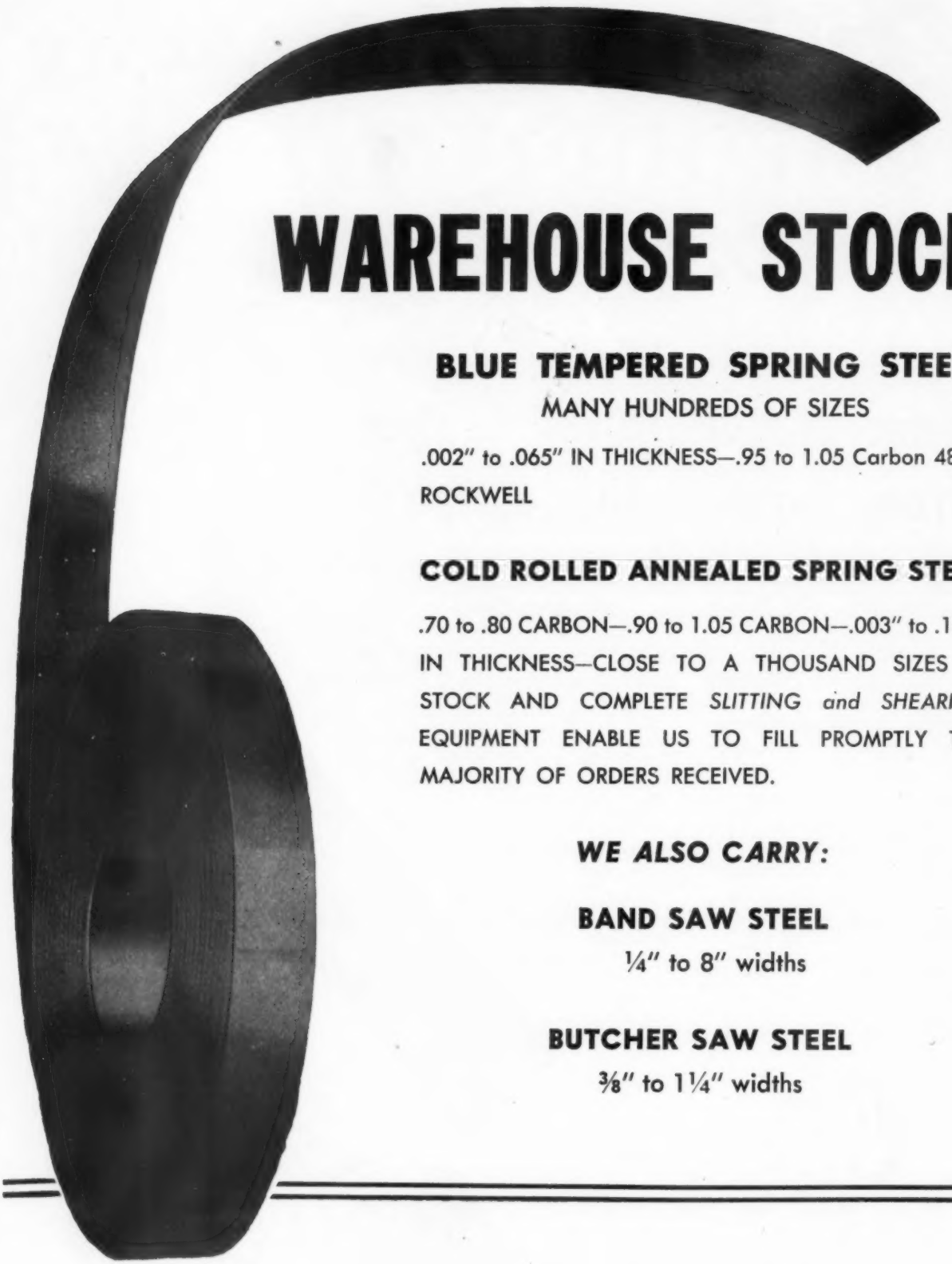

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MANY HUNDREDS OF SIZES

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COLD ROLLED ANNEALED SPRING STEEL

.70 to .80 CARBON—.90 to 1.05 CARBON—.003" to .183" IN THICKNESS—CLOSE TO A THOUSAND SIZES IN STOCK AND COMPLETE *SLITTING and SHEARING* EQUIPMENT ENABLE US TO FILL PROMPTLY THE MAJORITY OF ORDERS RECEIVED.

WE ALSO CARRY:

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MOTORIZE YOUR MACHINE TOOLS

TURNER
UNI-DRIVE
Motorizes Machine Tools

1 No belts to shift. Drives to large step of cone at all speeds.

2 Eliminates overhead drive and counter shafts.

3 All advantages of geared head, with belt-drive smoothness.

4 Each unit operates independently.

SPEEDS PRODUCTION SAVES TIME • CUTS COSTS

● More speed... greater production... you must have them to keep apace! Enlist the aid of TURNER UNI-DRIVES. They'll increase production like an extra shift... save time... speed up work... keep down power costs. They're doing it in scores of shops and plants. They'll do it in yours. TURNER UNI-DRIVE is the *successful* motor drive.

Easily and quickly installed. They do away with overhead counter shafts... no belts to shift. Increase the efficiency of machine and operator. Drive on large cone at all speeds. One trial will thoroughly convince you.

Right now — today... investigate TURNER UNI-DRIVE. Write or wire us for full information.

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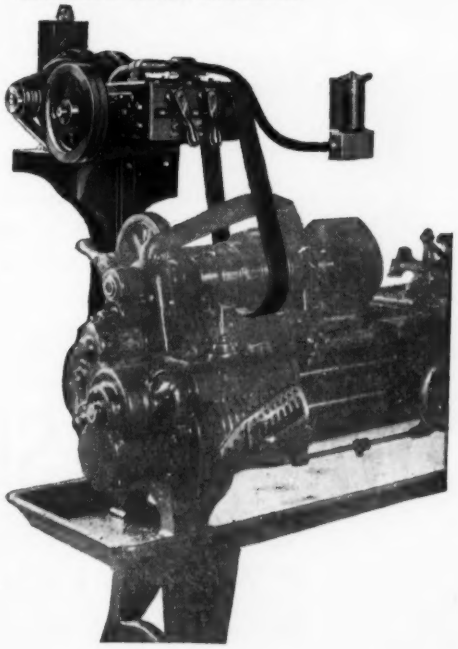
IT DOES THE JOB ON—

Lathes, Shapers, Milling Machines, Turret Lathes, Radial Drills, Boring Mills, Hobbing Machines and various machine tools. Also for Brown & Sharpe and Cleveland Automatic Screw Machines.



Tiny but essential are screws and other threaded members of modern industrial assemblies. Thousands of sizes and types of screw machine products are on the market for ready sale. Yet today sees some new design of instrument or machine in which mechanical function must derive from a screw machine product heretofore never known.

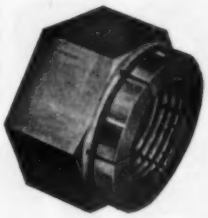
At this point Waltham Screw Company, its designers, its engineers and its precision machines come forward with the ability to produce the vital unit, to engineer it to exact specifications in whatever volume required.

The wasp, whose hexagonal cell-measurement never varies, is Waltham Screw Company's hall-mark. It denotes *utter precision.*

Telephone Today Collect
Waltham 5830

WALTHAM SCREW COMPANY

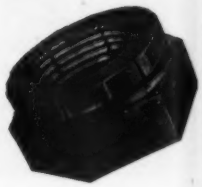
77 Rumford Ave.
Waltham, Mass.



A One-Piece LOCK-NUT

Pat'd—Pats. Pend. FLEXLOC

That "Holds Tight"



Yes . . . it's a two-in-one nut because, *all* the threads, including the locking threads, help to carry the load.

Pat'd—Pats. Pend.

- It is of one-piece construction
- It can be made of any of the conventional nut materials
- Every thread—including locking threads—takes its share of the load
- Its construction is especially advantageous for maximum strength and dependability of low and thin nuts
- It accommodates itself to a very wide range of thread tolerances
- It can be used over and over again without losing its ability to lock
- It is not affected by temperatures likely to be met within the field of Mechanical Engineering
- Being a "stop" nut, it stays locked in any position on a threaded member

Sizes from #6 to 1" in diameter.

Write for Bulletin 582.

The Famous "Unbrako" Socket Screw Products are also made by us.
OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNSYLVANIA BOX 4
Boston • Chicago • Detroit • Indianapolis • St. Louis • San Francisco

The simpler... ...the Better!

Model 11020-A

GUSHER
COOLANT PUMPS

Simple in design, sturdy in construction, Ruthman Gusher Pumps are trouble free, long lived, and efficient in operation.

There are fewer parts to wear, resulting in less friction, minimum maintenance costs, constant dependable operation.

So specify Ruthman Gusher Pumps on your machines. There's a model for every requirement.

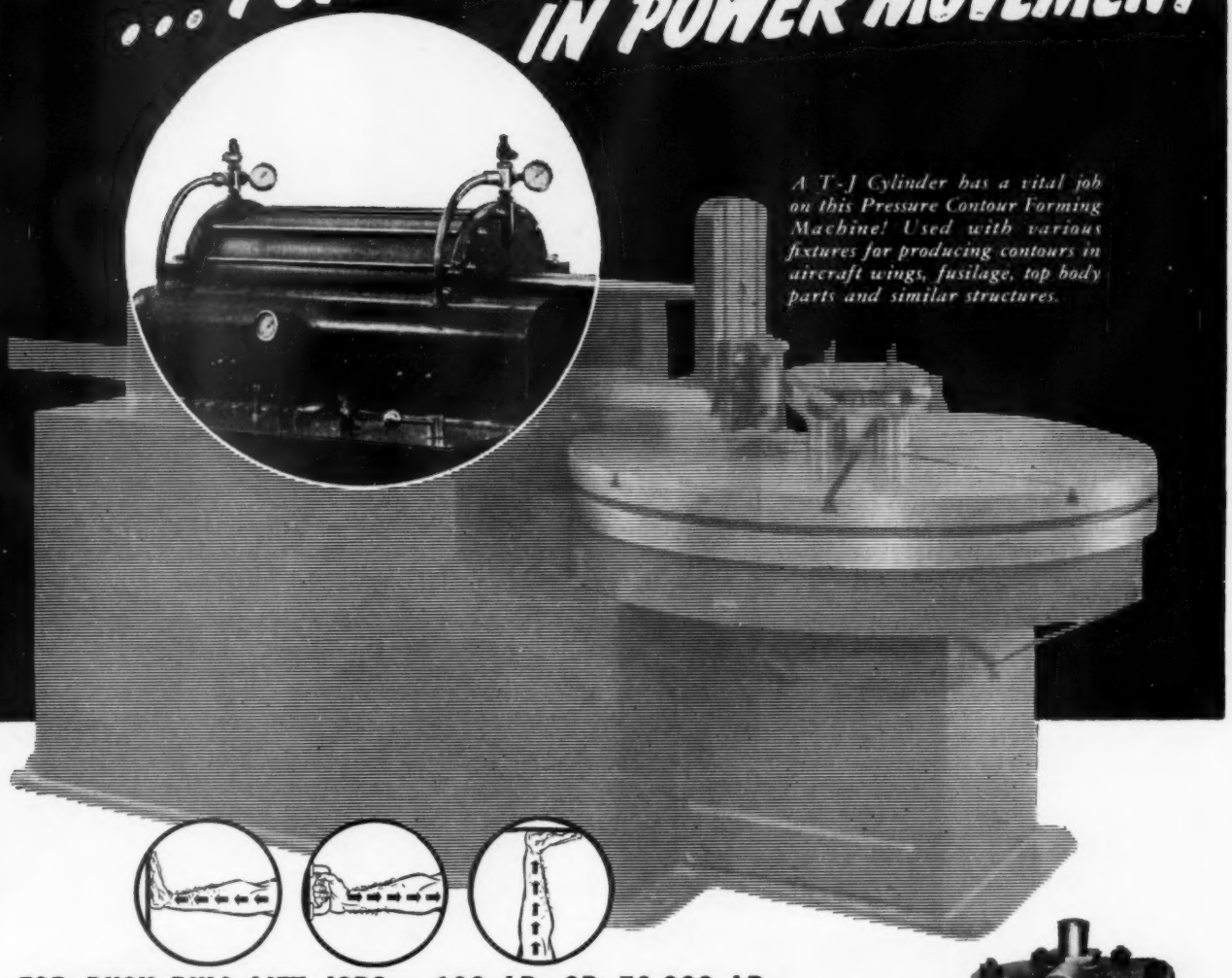
Write for our new condensed catalog.

THE RUTHMAN MACHINERY CO.
1809 READING ROAD
CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump For Modern Machine Tools

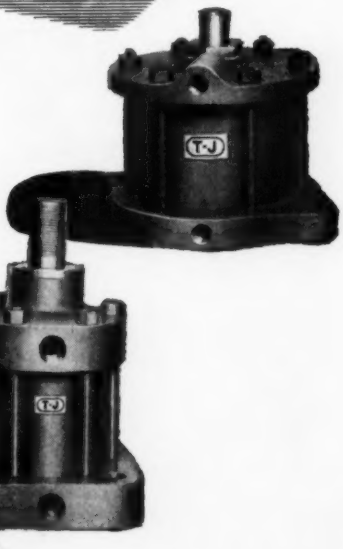
INDUSTRY SPECIFIES

T-J CYLINDERS

... FOR TOUGH JOBS IN POWER MOVEMENT



A T-J Cylinder has a vital job on this Pressure Contour Forming Machine! Used with various fixtures for producing contours in aircraft wings, fusilage, top body parts and similar structures.



FOR PUSH-PULL-LIFT JOBS...100 LB. OR 50,000 LB.

Today—more and more tough jobs in power movement throughout industry are geared to T-J Air and Hydraulic Cylinders!

Whether it's pushing, pulling, lifting, clamping or controlling... T-J Cylinders simplify the job and speed up production! Ideal for machines and equipment such as presses, hoists, shears, valves, brakes, hopper gates, ovens —or any place where efficient *controlled power movement* is needed. Many standard sizes and styles...both cushioned and non-cushioned types. Precision-manufactured to deliver smooth dependable power in every stroke —with utmost dependability and long life! Write for latest catalogs. The Tomkins-Johnson Company, 613 Mechanic Sreet, Jackson, Michigan.

FOR TOUGH JOBS SPECIFY T-J

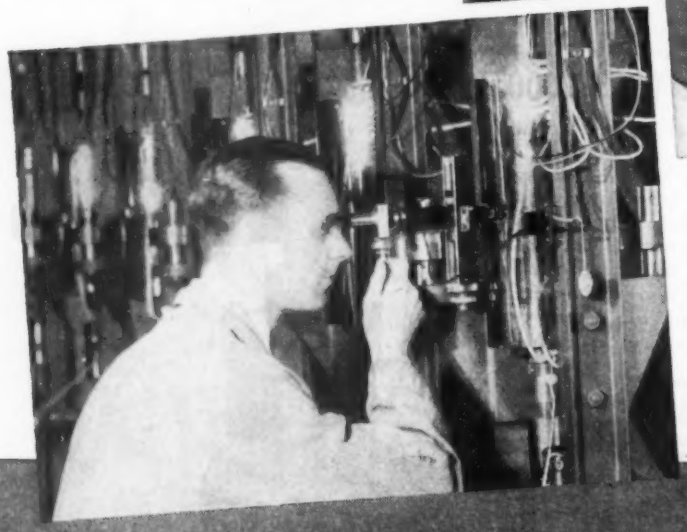
TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

FOR THE *Special* JOBS OF INDUSTRY

FOR PARTS that must have high surface hardness and wear resistance, that must retain hardness at elevated temperatures, that require high resistance to fatigue, a complete line of Nitralloy Steels (special U·S·S Carilloy Alloy Steels most suitable for case hardening by nitriding) is available. Our metallurgists will gladly discuss their application in terms of your requirements.

THE TOUGHNESS of alloy steel makes it the right material for the construction of forming machinery. The proper steel for each application can be designed to hold a true shape for thousands of operations and to resist the deteriorating effects of impact and abrasion.



OF THE TESTS which attempt to duplicate service conditions of high temperature operation, the long-time "creep" test is the most significant. The value of research work such as this is demonstrated in a striking way by the increased fuel economy being reported by central generating stations which, because of the stronger alloy steels now available for high temperature service, are able to operate safely at higher temperatures and pressures.

USS STEEL
UNITED STATES STEEL

...Electric Furnace Steels

★ **Special Heat-Resisting Steels**

★ **Aircraft Quality Alloy Steels**

★ **Bearing Steels . . . Nitralloy Steels**

IN ALL GRADES, IN ALL FINISHES, AND IN THE WIDEST RANGE OF SIZES

TO meet your present and future needs for these *quality* alloy steels, two completely integrated Electric Steel plants, one at Chicago and one at Pittsburgh, are ready to serve you.

Unequalled facilities for on-the-spot rolling, finishing and heat treating permit us to furnish electric furnace alloy blooms, billets and bars, slabs, plates, sheet and strip, as well as standard and special sections. Wide flexibility in furnace capacity makes it possible to handle, promptly, small orders as well as large.

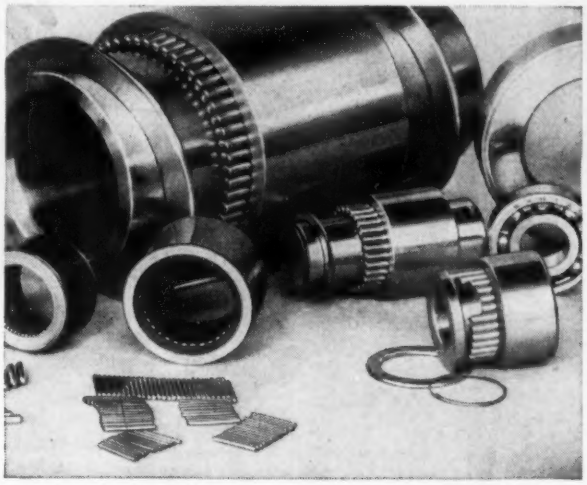
In these plants the fine art of steel making has been brought to new peaks of perfection. For not only are the men who control and operate them of thoroughly seasoned skill and experience, but they have at their service electric steel production equipment as fine, as complete and as modern as anywhere available.

The steels they produce reflect these facts. The close controls possible in the electric furnace assure consistently uniform response to heat treatment and to forging, machining and welding processes that can be readily translated into better performance of your end product.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

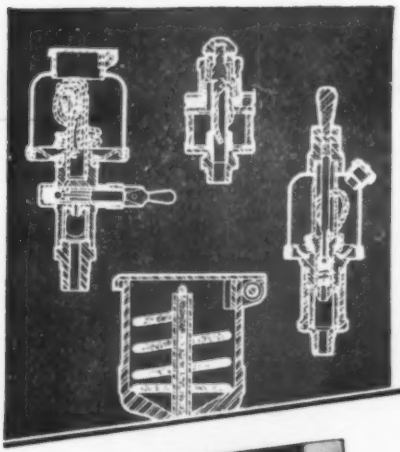
Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York



WHERE PRECISION is a "must," as with bearings and gears, the unvarying uniformity of U·S·S Carilloy Alloy Steels helps designers meet difficult performance standards. These steels are easy to forge, easy to machine, and respond consistently to annealing and heat treatment.

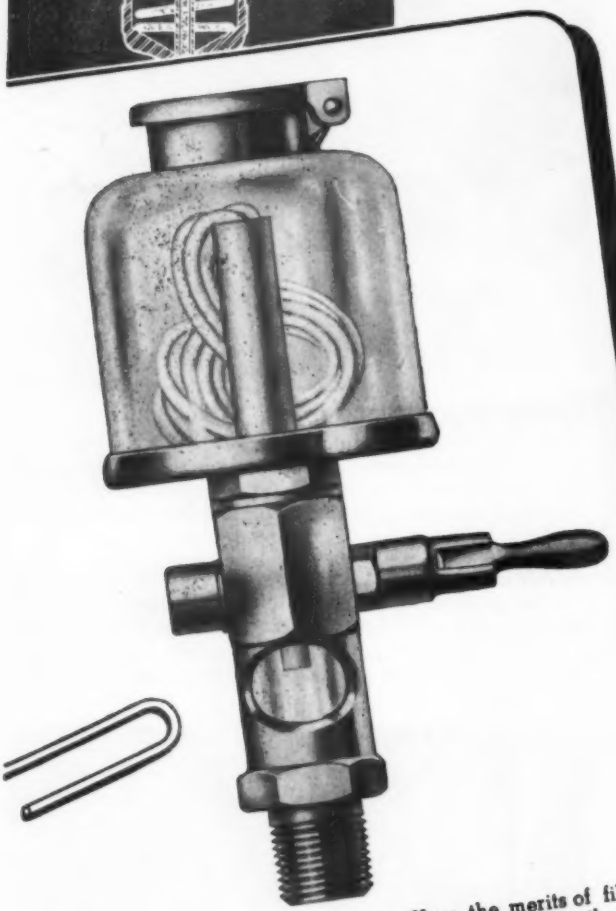
FRAMES, struts and actuating arms of this retractable landing gear are made almost entirely of special Aircraft Quality alloy steel forgings, that soak up tons of shock without weakening or giving way. On larger planes, hydraulic cylinders are shaped and welded from alloy steel plate.

UNITED STATES STEEL



POWER TRANSMISSION IS ONLY AS EFFICIENT AS *Your Lubrication*

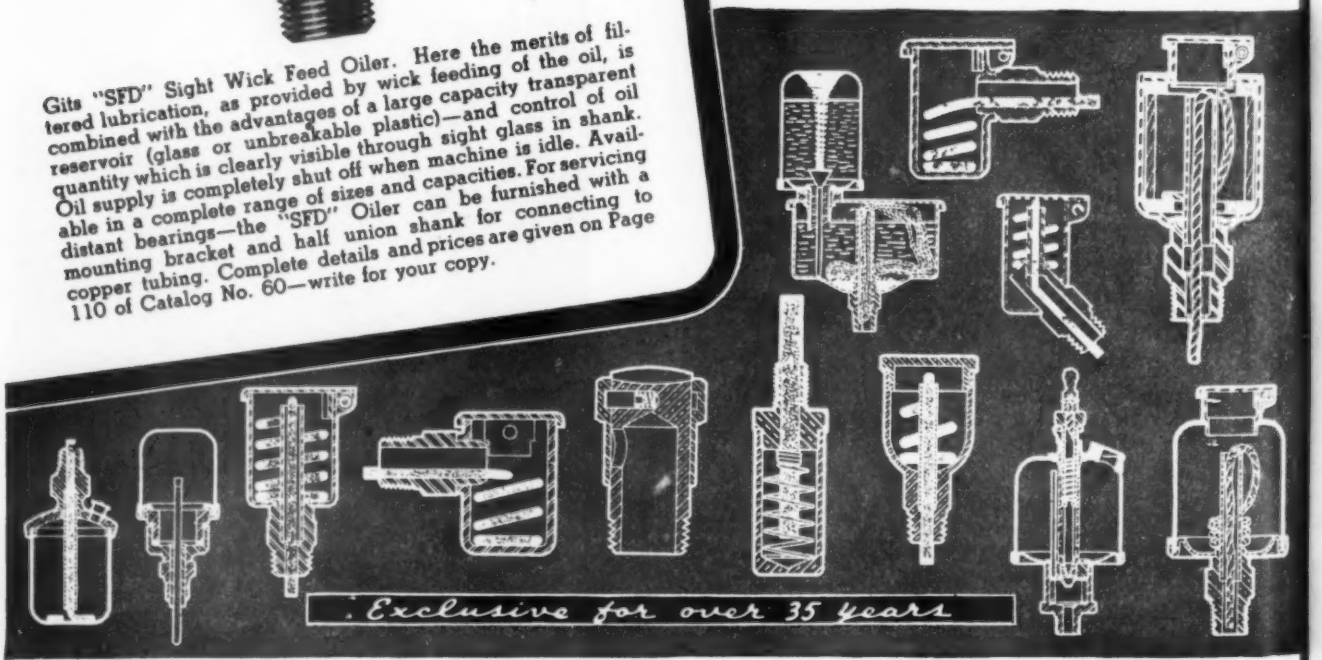
—and each lubricating problem must be considered a problem of special nature if maximum efficiency is to be expected. An inadequate, or outmoded lubricating system promotes friction, which is the basis of unnecessary wear and maintenance—and a serious waste of power. The choice of your lubricating system is therefore more than a mere choice of oiler capacity —it is a scientific problem of capacity, plus method, plus dependable function Whether your problem calls for a lowly oil hole cover that is essentially a short length of tubing with a hinged cover, or a more intricate device that is required to automatically lubricate many points from a central reservoir with a measured quantity of oil at given time intervals—you will practice true economy and insure maximum efficiency and service by employing the experience of Gits Engineers—the kind of experience that has been acquired the hard way When you are faced with a lubricating problem—consult Gits. Request Catalog No. 60 with 172 pages of lubricating devices and engineering data.

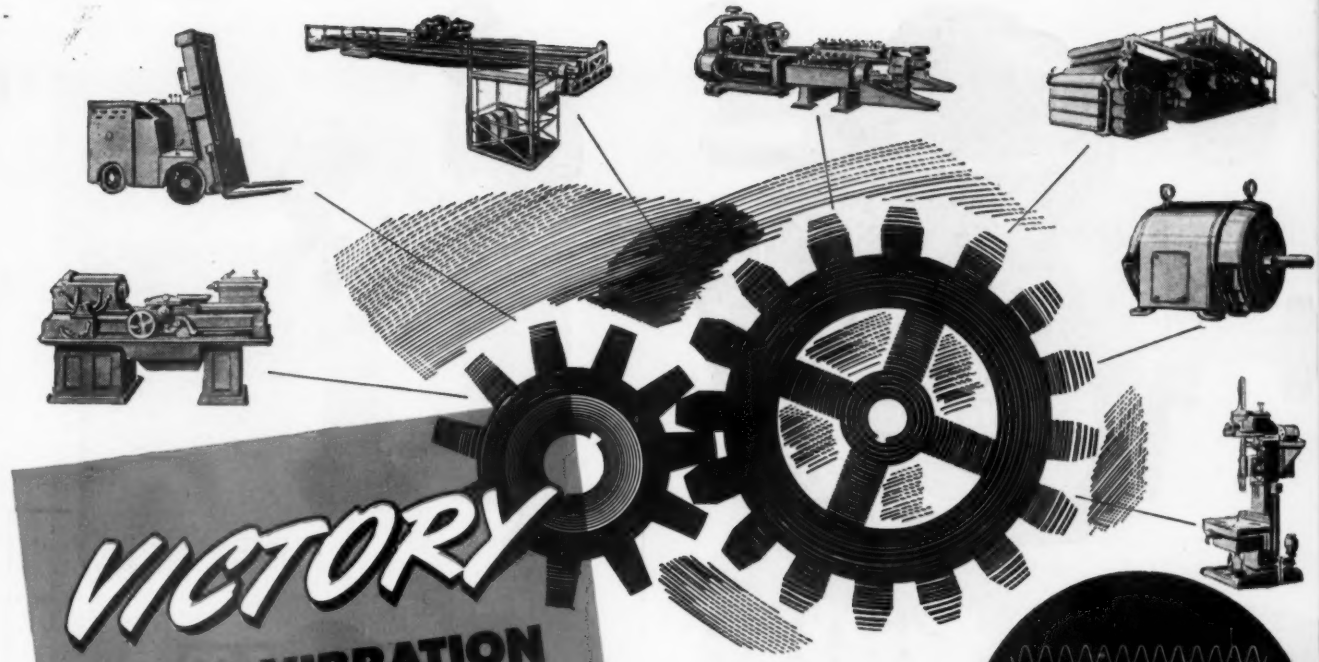


Gits "SFD" Sight Wick Feed Oiler. Here the merits of filtered lubrication, as provided by wick feeding of the oil, is combined with the advantages of a large capacity transparent reservoir (glass or unbreakable plastic)—and control of oil quantity which is clearly visible through sight glass in shank. Oil supply is completely shut off when machine is idle. Available in a complete range of sizes and capacities. For servicing distant bearings—the "SFD" Oiler can be furnished with a mounting bracket and half union shank for connecting to copper tubing. Complete details and prices are given on Page 110 of Catalog No. 60—write for your copy.

GITS BROS. MFG. CO.

1857 South Kilbourn Ave., Chicago 23, Illinois





VICTORY OVER VIBRATION *In Industry*

LORD
SHEAR TYPE
Bonded Rubber
MOUNTINGS

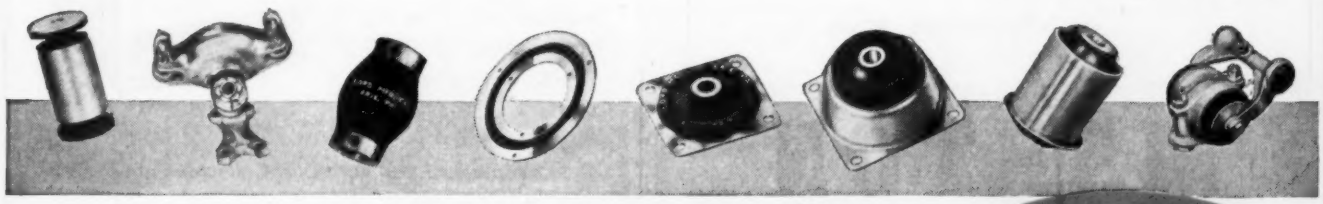
MAN'S struggle for speed and more speed, in travel and in production, is largely a struggle to combat the interfering and disrupting forces of vibration. Man has no practicable method for the *elimination* of vibration, but he can do much to *control* and *isolate* its harmful effects.

By flexible suspension of the entire machine, equipment life is prolonged by reducing metal fatigue; production is increased, its quality improved, through smoother operation; nervous strain on operators and other workers is greatly reduced. Also material is saved by eliminating base weight used for inertia mass. Other savings in production costs and improvements in efficiency of personnel are attained by separate mountings for motors, gauges, and tools. Lord Mountings combat the destructive forces of vibration as effectively as scientific lubrication combats the wearing effect of friction.

Lord is the Pioneer and leader in the science of vibration control and isolation thru the application of natural and synthetic rubber. Lord Shear Type Mountings and other Bonded Rubber Products are the embodiment of many exclusive techniques and patented features developed through years of research and practical application.

To help you select the proper Lord Mounting for your specific objective, or to design it for you, Lord engineers are at your service.

Every genuine Lord Mounting carries the name "LORD" embossed in the rubber or in raised letters on the forgings.



IT TAKES **BONDED RUBBER** *In Shear* TO ABSORB VIBRATION

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

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★ BUY VICTORY BONDS ★

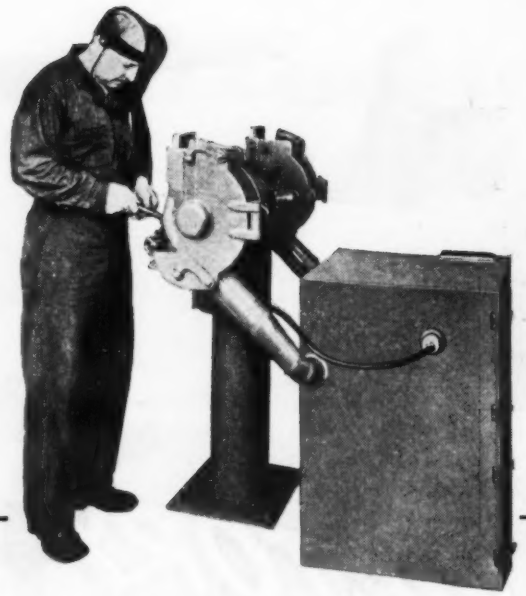
Originators of Shear Type Bonded Rubber Mountings

Plus values are assured with the combined air control action of the Marton Air Control Unit. This unit combines pressure regulator, gauge, control valve, lubricator and strainer in one neat, compact construction.

The use of the Marton Air Control Unit eliminates the extensive pipe fitting required of separate units and thereby reduces the cost of installation. It is easily adjusted, simply maintained and completely accurate!

For information write to—

MARTON
EQUIPMENT, INC.
505 Rantoul St., Beverly, Mass.
SMALLPEICE
MACHINE TOOLS AND EQUIPMENT
Manufactured in U. S. A. and Great Britain

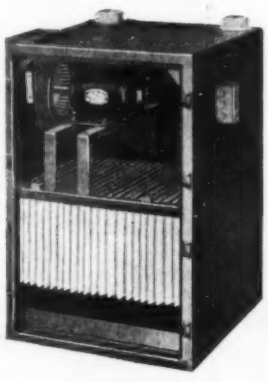


TORIT

DUST COLLECTORS

are self-contained and portable. They fit into production changes and protect valuable machinery from abrasive dusts.

In one operation TORIT Dust Collectors trap dust at the source and recirculate the clean air back into the room. Easily installed without complicated wiring or piping problems, they are the answer to your dust menace.



TORIT Dust Collectors range in size from ⅓ HP to 3 HP. Compactly housed in the steel cabinets are motor, fan, fan housing, and a set of spark resistant filter bags. The unique method of filtering makes removal of filtered dirt a simple matter.

Write for latest Torit Dust Collector Catalog No. 29 giving full information and descriptions of the different size units.

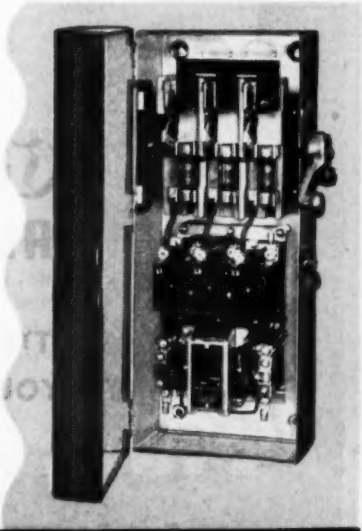
TORIT MANUFACTURING CO.
280 WALNUT ST. ST. PAUL 2, MINN.

3 important advantages in this installation of Square D Combination Starters

SAVES TIME Disconnect Switch and Magnetic Starter are housed in one enclosure—thus saving mounting and wiring time.

CONSERVES SPACE Square D Combination Starters require substantially less space than individually mounted switches and starters.

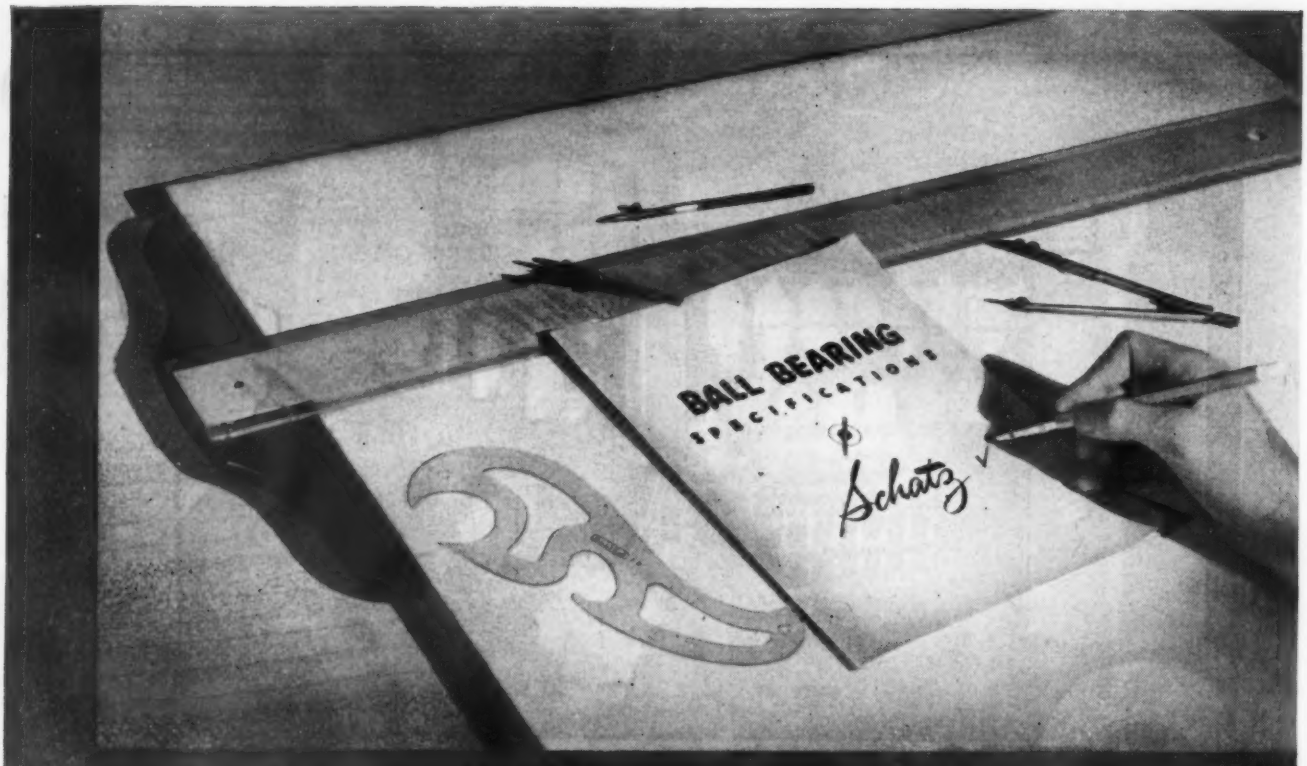
INCREASES SAFETY The cover of the enclosure is interlocked with the operating handle of the disconnect. Thus, the cover cannot be opened on a "live" starter.



Write for Bulletin 8538 which gives details and illustrations of complete line. Address Industrial Controller Division, Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES



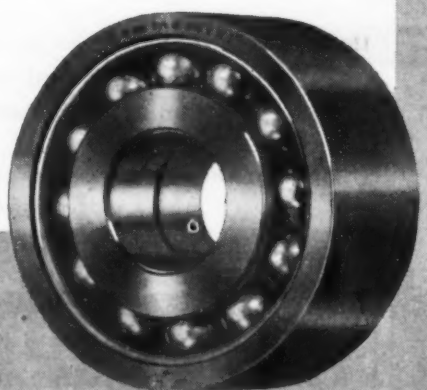
SMART ENGINEERING!

On drafting boards throughout the nation, Schatz "Commercial" ball bearings are FIRST in ball bearing specifications, — first, because they are strong, durable, and moderately priced.

Smart engineering means Schatz "Commercial" ball bearings for your plant, or product,—the best ball bearing value on the market.

SCHATZ
"Commercial"
BALL BEARINGS

ALL TYPES AND SIZES OR MADE TO YOUR B.P. SPECIFICATIONS



THE SCHATZ MANUFACTURING COMPANY
POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT
Detroit: 2840 Book Tower—26 • Cleveland: 402 Swetland Building—15
Chicago: 902 S. Wabash Ave.—5 • Los Angeles: 5410 Wilshire Blvd.—36

VIBRATION & NOISE CONTROL BY Harris PRODUCTS . . .

Harris Compressed-Rubber shackles cushion out shocks and vibrations, require no lubrication and operate noiselessly and without wear.

Duflex mounts come in a variety of sizes, shapes and load ratings for vibration - isolation of radio, aircraft and electrical apparatus.

Torflex Flexible shaft-couplings compensate for parallel or angular misalignment, provide electrical insulation and smooth out impulses.

Torflex Flexible Bearings consist of a stretched tube of rubber between two metal sleeves which hold the rubber in the stretched state. Pressure exerted by the rubber on the metal sleeves insures a high-capacity mechanical bond. They come in a wide range of sizes.

Harris products, engineered for the control of vibration and noise were not "war born" - on the contrary they were created, designed and widely used in civilian fields years before the war.

We pioneered in engineered vibration and noise control and much of the progress made in this highly specialized field is due to our engineers, who have designed and created many items for a wide variety of applications.

Millions upon millions of Harris products are serving industry and have been for years.

When war was declared our government took advantage of our many years experience with the result that Harris products were used extensively on Bombers, Fighters, Jeeps, Trucks, Tanks etc.

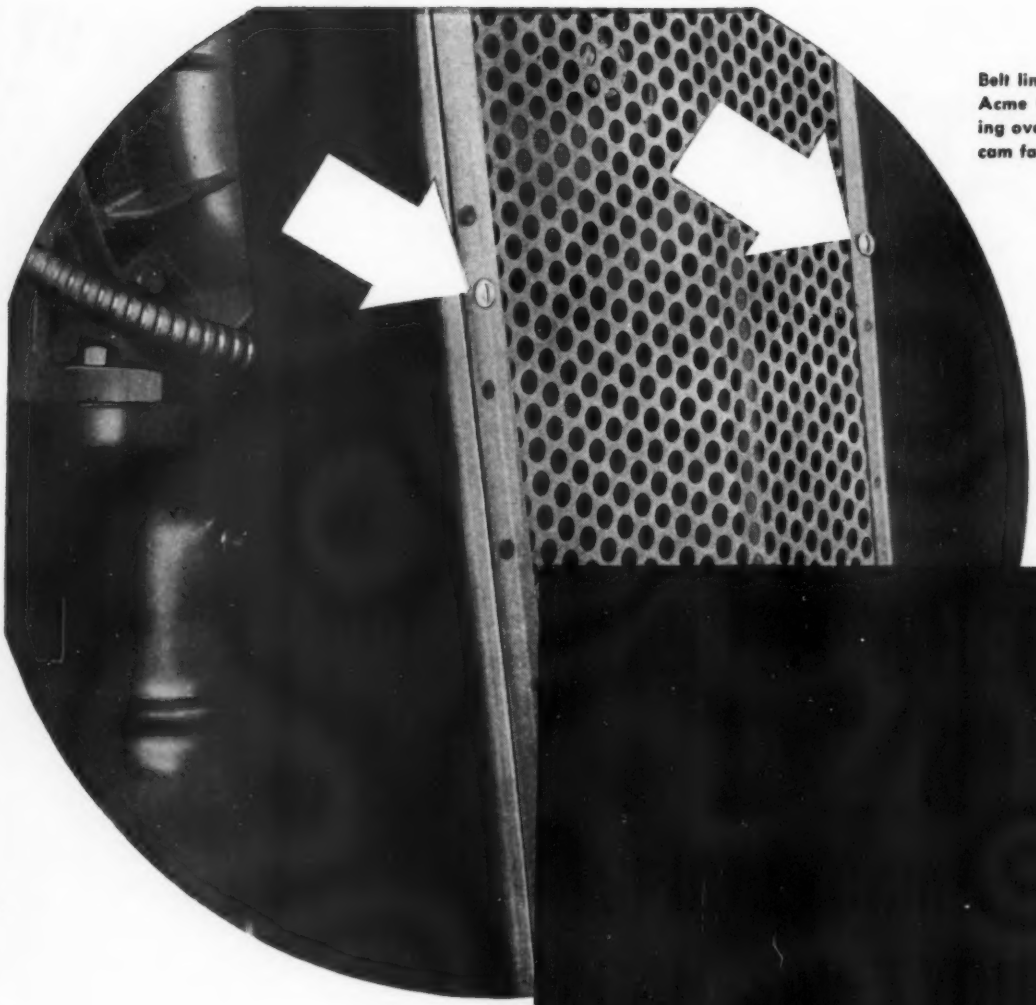
Engineers are becoming aware of the fact that the control of vibration and noise will greatly increase the utility, efficiency and life of their products, consequently many new as well as old products on the peacetime market will be equipped with Harris products.

Our experience as specialists in vibration and noise control are available to you in the solution of your problems. Drop us a line today and acquaint us with the facts of your problem.

HARRIS PRODUCTS CO.

CLEVELAND 4, OHIO, U. S. A.

Branches: 44 Whitehall St., New York • General Motors Bldg., Detroit, Mich.

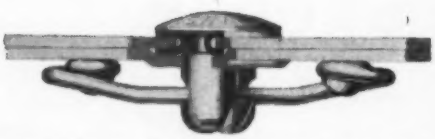


Belt line housing cover plate on Acme Gridley Automatic showing oval head type of Dzus spiral cam fastener.

Fastener Stud

Gromet

Spring



Complete assembly of the Dzus spiral cam fastener

is
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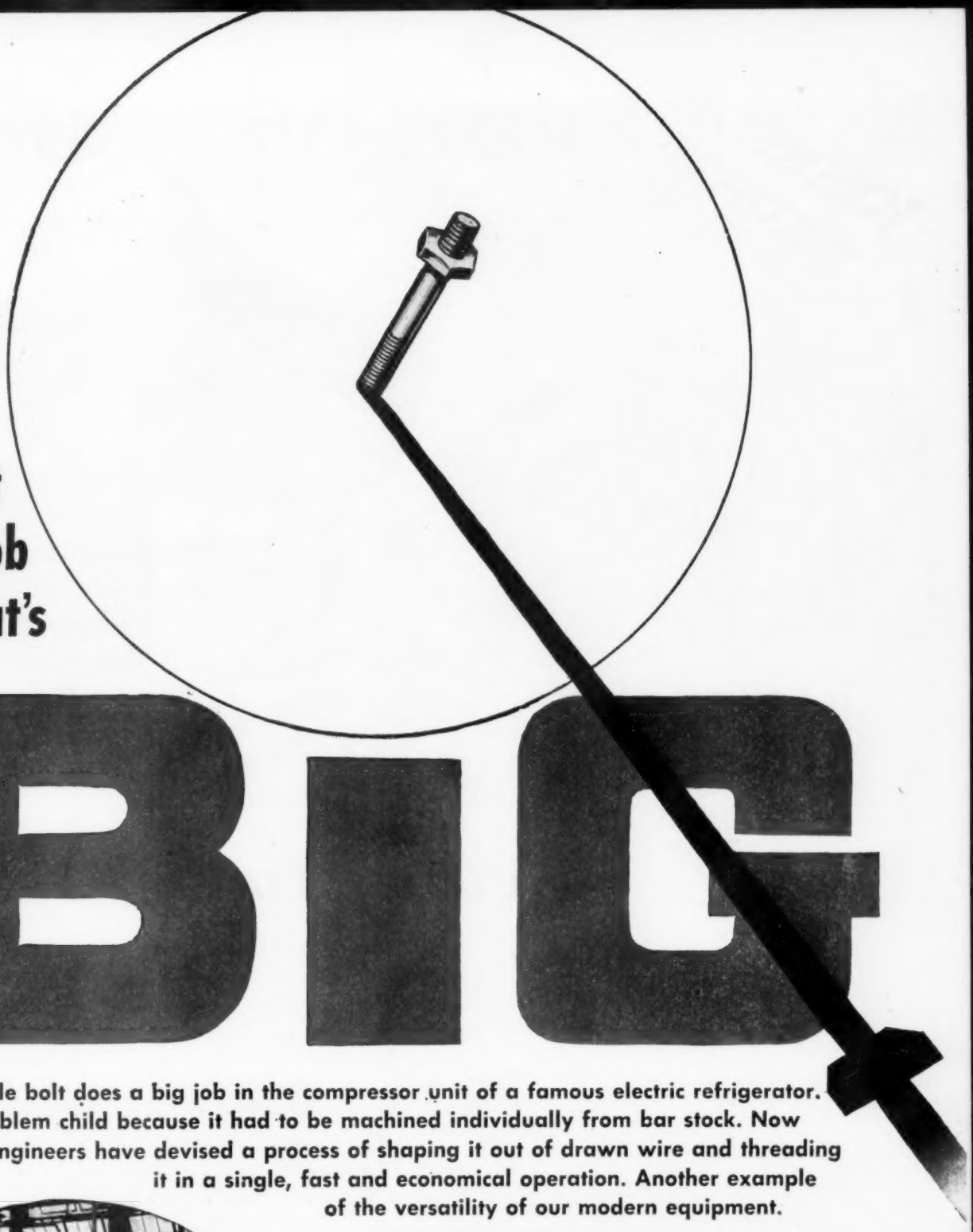
that's



BIG

This little bolt does a big job in the compressor unit of a famous electric refrigerator. It was a problem child because it had to be machined individually from bar stock. Now Buffalo Bolt engineers have devised a process of shaping it out of drawn wire and threading it in a single, fast and economical operation. Another example of the versatility of our modern equipment.

BUFFALO BOLT COMPANY

NORTH TONAWANDA, NEW YORK
SALES OFFICES IN PRINCIPAL CITIES

(B) Each of this battery of Buffalo Bolt roll threaders has a capacity of 43,000 bolts per working day.

JOHNSON BRONZE SLEEVE TYPE BEARINGS

Ready to use...

Johnson General Purpose Bearings save precious time in many ways. When you place your order you have over 800 sizes to choose from. This enables you to buy exactly according to your needs. Every General Purpose Bearing is completely machined inside—outside and ends. Thus they are ready for immediate installation. There is no extra machining . . . no cutting down . . . no excess stock to remove. Oil grooving slots or holes are easily, quickly and economically added when necessary.

When properly installed, Johnson General Purpose Bearings will deliver a maximum of service with a minimum of attention. The next time you need plain, cast bronze bearings—call in your local Johnson Distributor. Permit him to show you how to save both time and money . . . how to avoid waste and delay by specifying Johnson General Purpose Bearings.

NEW *Catalogue*

72 pages...lists and describes the most complete sleeve bearing service in the world. Write for your copy...TODAY.

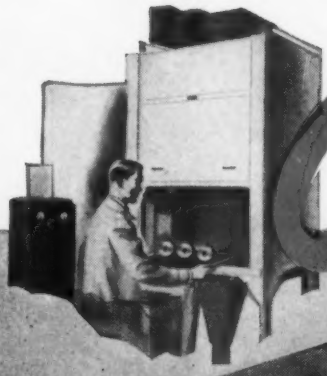
JOHNSON BRONZE

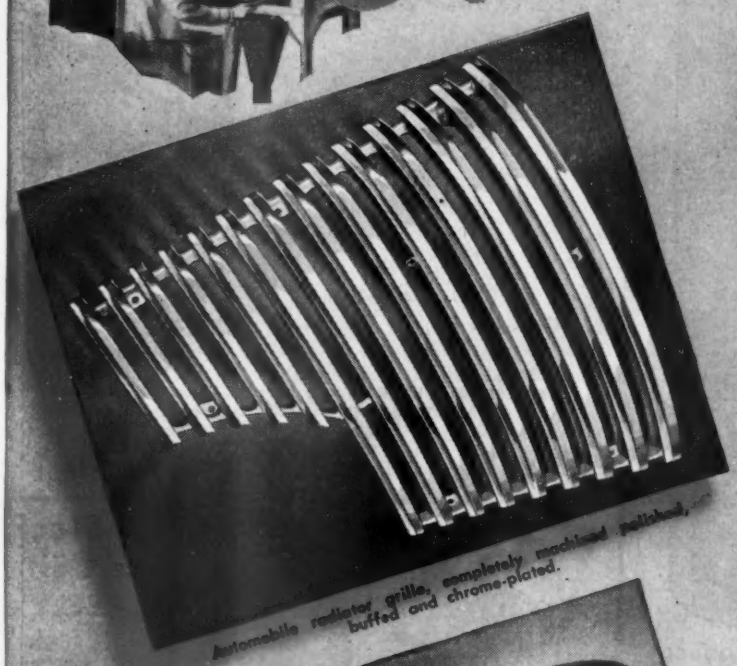
SLEEVE BEARING HEADQUARTERS

The MOST COMPLETE SLEEVE BEARING SERVICE in the WORLD

515 S. MILL STREET NEW CASTLE, PA.

NOTHING LEFT TO *chance!*





Automobile radiator grille, completely machined, polished, buffed and chrome-plated.

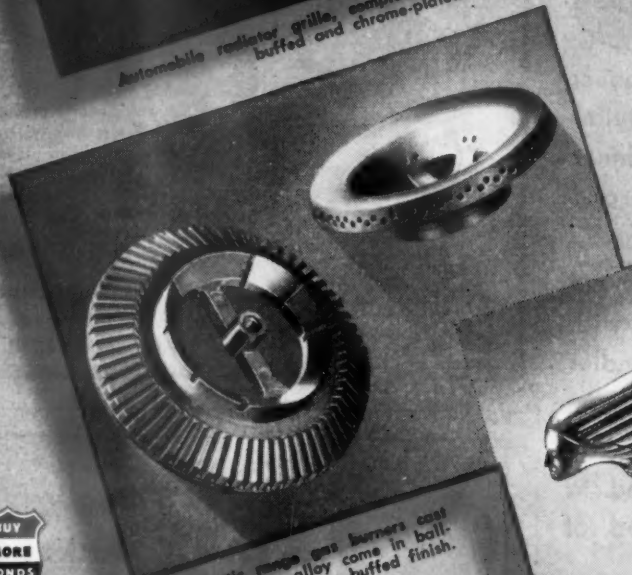
NOTHING is left to chance at the Auto-Lite Die Cast Plant in Woodstock where "Controlled Metals" give die castings strength, accuracy, finish. Auto-Lite's complete testing routines, such as spectographic analysis, metallographic studies, X-ray inspection and stress relieving are constantly on guard against faults and lack of uniformity.

All of these modern inspection processes are available under one big roof, together with the finest equipment for aluminum and zinc die-casting, machining and every type of finishing. For information on how Auto-Lite can help solve your die cast problems write to

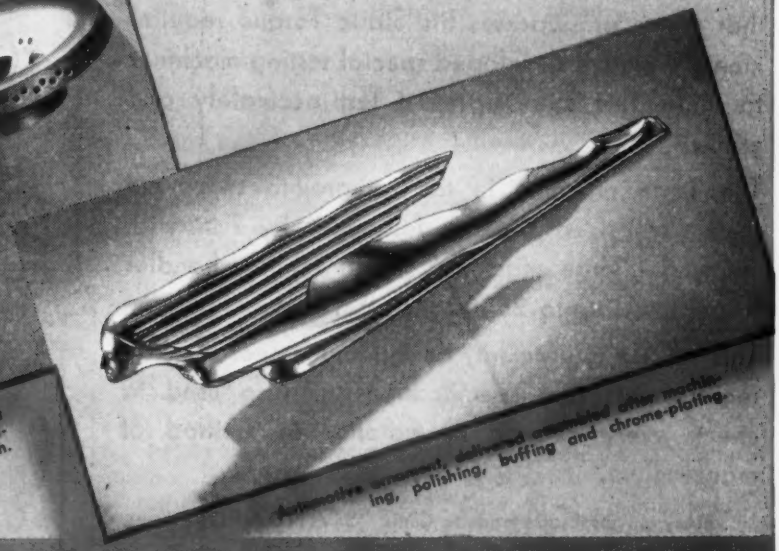
THE ELECTRIC AUTO-LITE COMPANY
Die Casting Division
WOODSTOCK, ILLINOIS

600 S. Michigan Ave.
CHICAGO 5, ILLINOIS

723 New Center Bldg.
DETROIT 2, MICHIGAN



Domestic range gas burners cast of aluminum alloy come in ball-burnish or buffed finish.



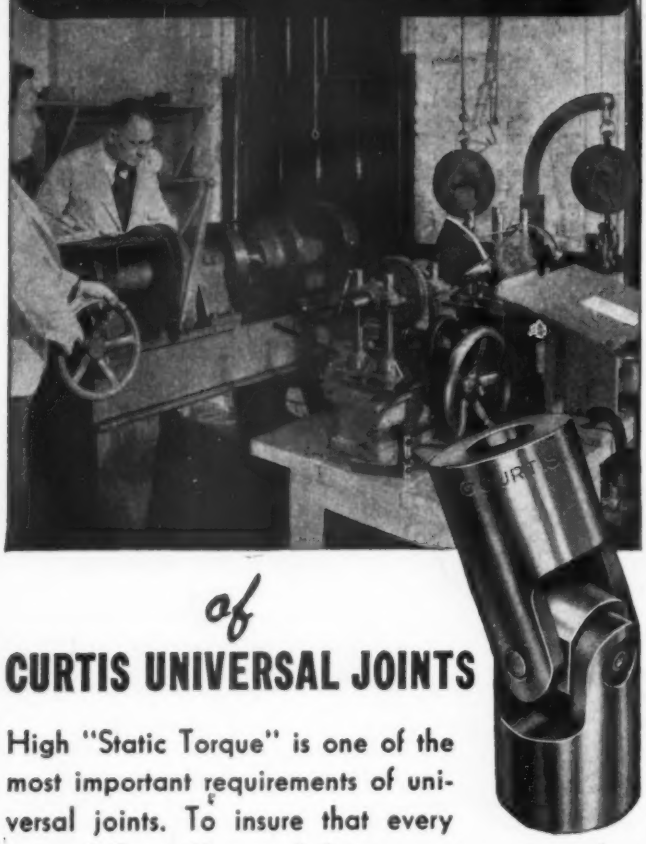
Automotive armament, delivered assembled after machining, polishing, buffing and chrome-plating.

BUY MORE BONDS

AUTO-LITE Die Casting

TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES—SATURDAYS, 8:00 P. M.—E.T. ON CBS

Static Torque TESTING . . .



of CURTIS UNIVERSAL JOINTS

High "Static Torque" is one of the most important requirements of universal joints. To insure that every user of Curtis Universal Joints receives a product that meets or surpasses his Static Torque requirements, we have developed special testing machines to make this one important test accurately and efficiently.

The small machine in the foreground twists the three small sized joints to destruction by 5 inch lb. steps, the large machine, shown in use, handles larger joints up to 25000 inch lbs.

This testing equipment, designed to meet A.A.F. requirements and specifications, is also used to check every change in material or method of manufacture.

Every universal joint made to Curtis "STANDARDS" is stamped with our Registered Trademark.

Write for technical data and useful Engineering Templates.

CURTIS UNIVERSAL JOINT CO. INC. SPRINGFIELD MASS.

NO CLOGGED DRAINS

With Turco's Hand Cleaner

Handisan cuts grease, grime, stains—yet is milder than many toilet soaps

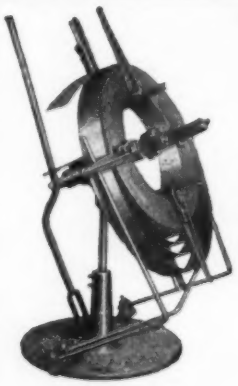
Because Turco Handisan is completely soluble it cannot form wasteful lumps to clog dispensers and stop up drains. It is an ideal mechanic's soap so gentle that it actually soothes bruised, chapped hands, yet so effective that it quickly removes grease, grime, ink and stains. It will not chap hands. Mildly but effectively antiseptic.

The secret is the perfect combination of granular toilet soap and an extremely fine, non-scratching and non-irritating abrasive powder. Write Turco, today

Send for free sample
Dept. AM-11

TURCO INDUSTRIAL CLEANING COMPOUNDS

TURCO PRODUCTS, INC. Main Office & Factory: 6135 S. Central Ave., Los Angeles 1
Offices & Factories: 125 W. 46th St. - Chicago 9 • 1606 Henderson St., Houston 1, Texas
New York Office: 415 Greenwich St., New York 13 - Offices & Warehouses in All Principal Cities



No. 3 Littell Reel. Capacity, 300 lbs.

Reel-Off Coil Stock Faster at Less Cost with LITTELL REELS

COIL feeding with LITTELL Automatic Centering Reels increases production, lessens waste, improves quality, loads easier. Littell Reels are made in plain or motor-driven types for handling coils 100 to 20,000 lbs. Littell also makes Roll Feeds, Straighteners, Safety Feeders, etc.

Send for Bulletins

F. J. LITTELL MACHINE CO.
4169 Ravenswood Ave.
Chicago 13, Ill.

DANLY Socket-Head Cap Screws

"Danly Knurled" is noted for high quality and accuracy. Specify it by name "Danly Knurled."

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue • Chicago 50, Illinois
Milwaukee 2 . . . . . 111 E. Wisconsin
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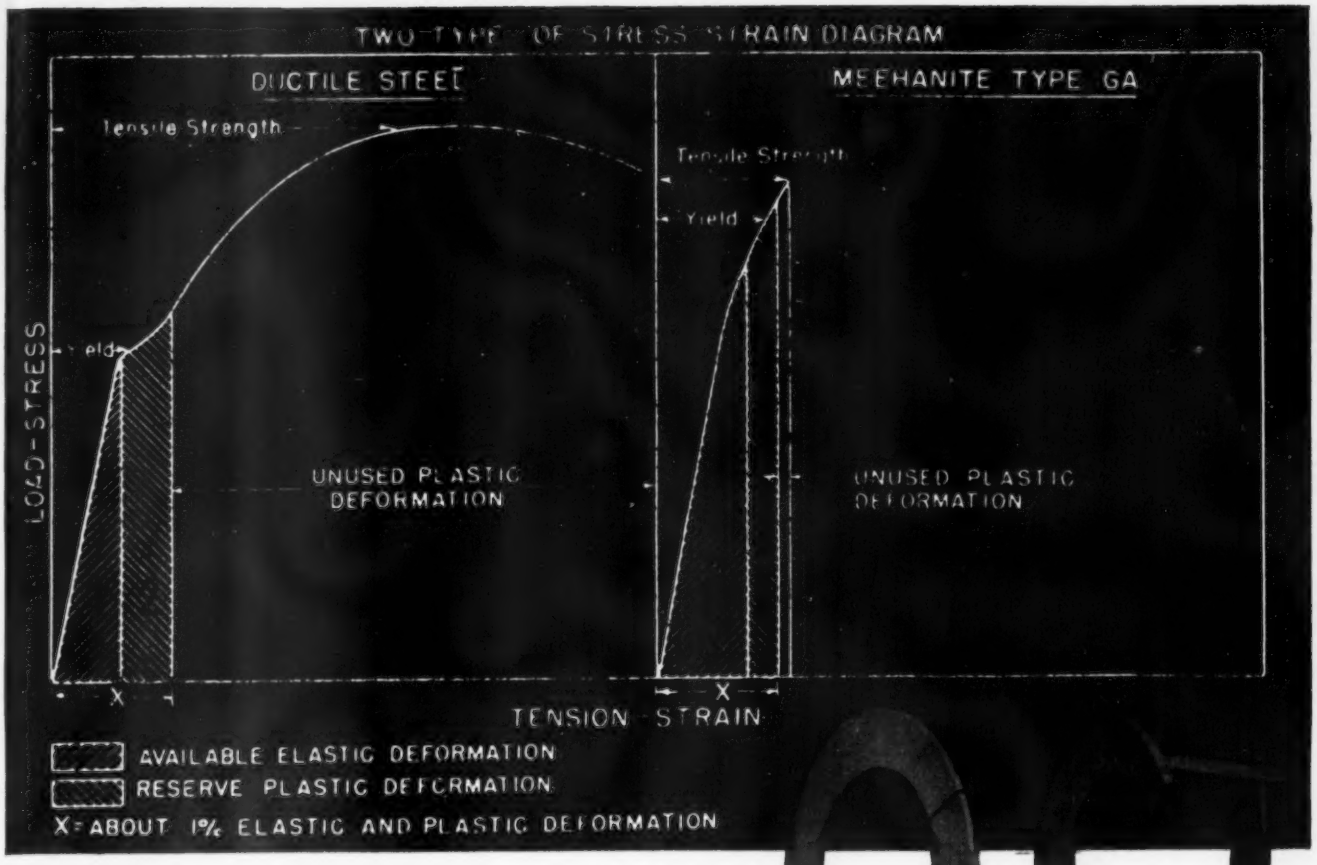
Dayton 2 . . . . . 990 E. Monument
Rochester 4 . . . . . 16 Commercial St.
Philadelphia 40 . . . 3858 Pulaski Ave. • *Long Island City 1* . . . . 47-28 37th St.
Ducommun Metals & Supply Company, 4890 South Alameda, Los Angeles



MEEHANITE CASTINGS ARE TOUGH!

This 1" thick section was cut from a heavy Meehanite casting. It was possible to split the piece as shown 3½" before fracture.

FACTS, FIGURES, DATA, AVAILABLE AND RELIABLE FOR THE USERS OF MEEHANITE CASTINGS

In engineering design the ultimate breaking strength of any material is rarely used. Designers require safety in service, not failure. There is a considerable gap between the yield point and the ultimate strength.

The stress-strain diagrams plotted from a tensile test of mild steel and Type GA Meehanite appear as shown above.

Steel shows both a higher ultimate strength and elongation value than Meehanite. The important point, however, is how much of these values can be used in unit design.

The diagrams reveal three distinct areas:

1. *Stress absorbed during elastic deformation. This has relation to the Modulus and Yield strength.*
2. *Stress absorbed during elastic and plastic deformation which has some relation to the reserve of plasticity available against sudden fracture.*
3. *Plastic changes recording deformation during failure.*

Areas 1. and 2. illustrate in a general way, the relative capacity of both materials to absorb working stress in service up to approximately 1% plastic deformation, which is as much as any normal engineering construction can endure.

They show that to this extent Meehanite, despite its lower ductility, does have as large an area for plastic adjustment to distribution of the load as the so-called ductile metals.

This explains why Meehanite is finding wider engineering applications in structures normally calling for high elongation and reduction of area values.

MEEHANITE RESEARCH INSTITUTE
NEW ROCHELLE, N. Y.

What's back of the lowest bid?

It's easier to ask — *and answer* — this question *before* putting out for bids. Because once the bids are in you may find your choice limited.

You know how difficult it is to write specifications that cover *every* possible contingency. For instance, it may turn out that you could use . . .

1 *Engineering Service* to work out functional design and material in terms of greater mass production . . .

2 *Production Facilities* to meet unforeseen requirements covering strength . . . accuracy . . . finish . . . while keeping delivery and cost in line with your needs.

3 *Manufacturing Stability* — the sound reputation of a supplier that justifies your choice of source for vital parts.

P-3

M³ MEN MATERIALS MACHINES

facilities insure

your ultimate satisfaction with your precision parts. And the bid may not be out of line! This bulletin is published in Sweet's File 4m10 for Product Designers. If you prefer that we send you a copy, please request it on your letterhead.

THE CORBIN SCREW CORPORATION

The American Hardware Corporation, Successor

NEW BRITAIN CONNECTICUT

CORBIN

See Sweet's Product Design Catalog, outline of Corbin Products and Facilities

Precision Parts

Take a handful of Corbin Screws

You'll see clean, saw-cut slots or true-shaped Phillips recesses, well-formed heads correctly centered over strong, straight shanks; deep, keen threads with sharp points.

Corbin Slotted Wood Screw

You'll see what we mean by *uniform accuracy*, which allows only the best to get through Corbin — to you.

Corbin-Phillips Wood Screw

Look to Corbin Screw Corporation for your requirements in Corbin-Phillips and Corbin Slotted Wood Screws, Machine Screws, Hardened Sheet Metal Screws, Self-Tapping Machine Screws, Stove Bolts. Also Steel Drive Screws, Lag Screws, Cap Screws, Set Screws, Hex Semi-Finished Nuts, Machine Screw Nuts, Escutcheon Pins and Chain.

Corbin Slotted Sheet Metal Screw

Corbin-Phillips Sheet Metal Screw

We manufacture Aircraft Screws and Nuts to government specifications.

Corbin Slotted Machine Screw

See your Distributor — also complete stocks at Chicago, New York and New Britain . . . and sales representatives who can "talk shop."

Corbin-Phillips Machine Screw

S-11

Production goes up when VEELOS goes on at INLAND STEEL

Belt Slippage Ended . . . Lathe Takes Cut Almost Twice As Deep

The "Before and After" Story of a Belt Drive. The photograph at the left shows a flat belt drive on a Libby Turret Lathe at the Inland Steel Company; the photograph at the right shows turret lathe after replacement of flat belt with Veelos. Idler has been eliminated . . . belt slippage has been ended . . . and the lathe now takes a cut almost twice as deep as before.

Link Construction Ups Production

WHEREVER Inland Steel Company has installed Veelos, machine production has increased.

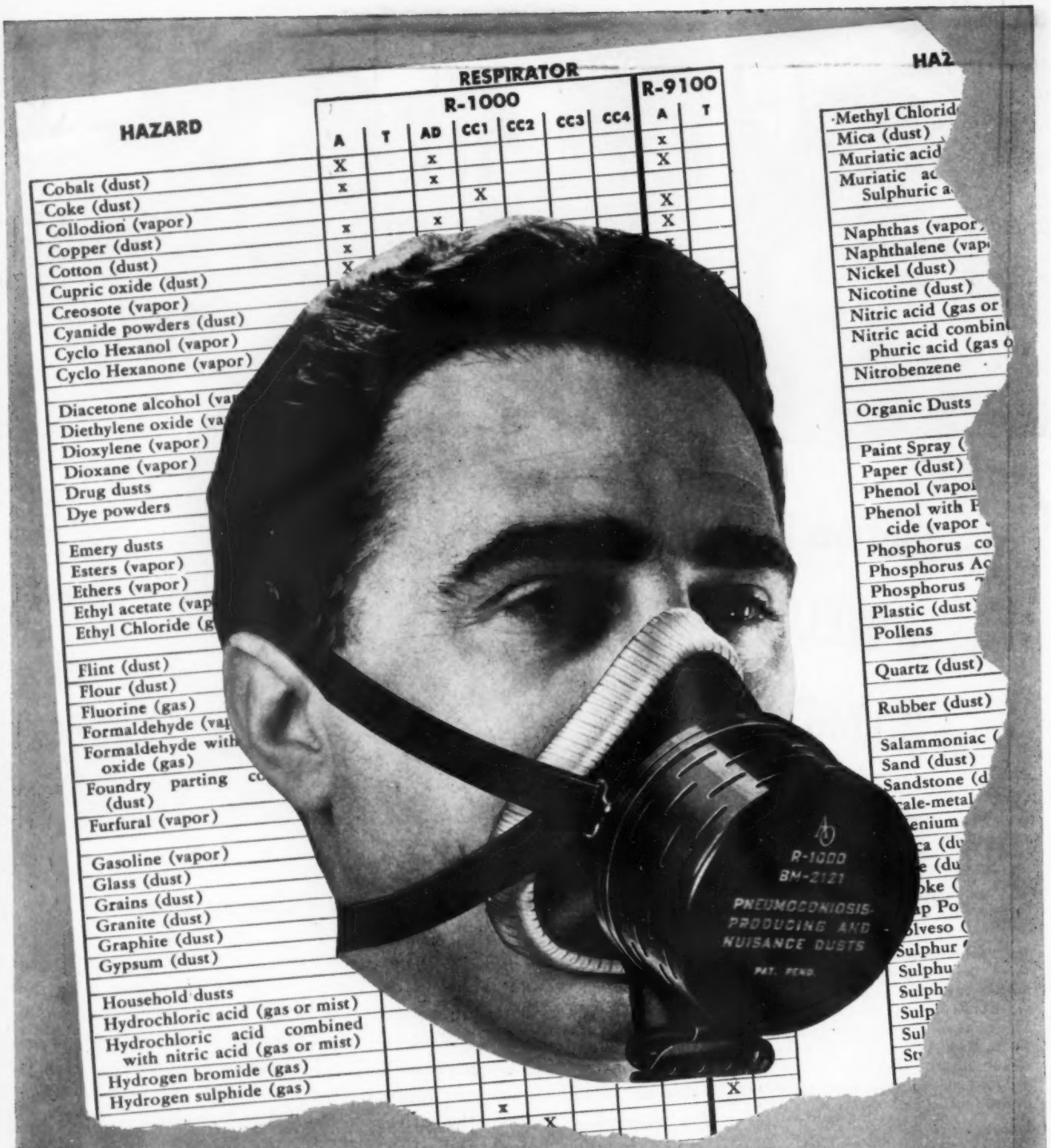
Veelos—the adjustable V-belt—has demonstrated its unquestionable value to Inland department heads. For example, consider the drives shown in the "before and after" photographs of the Libby Turret Lathe. The former flat belt drive constantly slipped. Veelos ended this slippage completely. In fact, *these Veelos drives have not even been readjusted since their installation in May, 1944.* Yet these drives operate 24 hours a day, 6 days a week. All need for the idler shown with the flat belt drive has been eliminated. And, equipped with Veelos, this turret lathe takes a cut almost twice as deep as it was able to take when equipped with flat belt.

In All Metalworking Industries, Veelos Helps Increase Production

Write today for your free Veelos manual as your first step toward using Veelos. A single drive will convince you of the advantages of Veelos . . . just as Inland has been convinced.

VEELOS
THE LINK
V-BELT
Adjustable to any Length
Adaptable to any Drive

MANHEIM MANUFACTURING & BELTING COMPANY
MANHEIM, PA.



AO R-1000 Means—7 Respirators in 1

The AO R-1000 Respirator is equipped with seven interchangeable cartridges, providing protection against more than 140 types of dust, vapors and gases.

Adaptability of design, pliability of rubber, and smoothly rounded face-contacting edges make it possible to fit the AO R-1000 to any face safely, comfortably and without adjustment.

Exhalation valve assures complete expulsion of exhaled air, even when worker's head is down; can't stay open or fill with moisture; dust cannot infiltrate.

Inhalation valve provides positive protection under all conditions; holds re-breathing to minimum; keeps efficiency at high level; admits air at the lightest intake of breath.

Your nearest AO Representative will be glad to demonstrate.

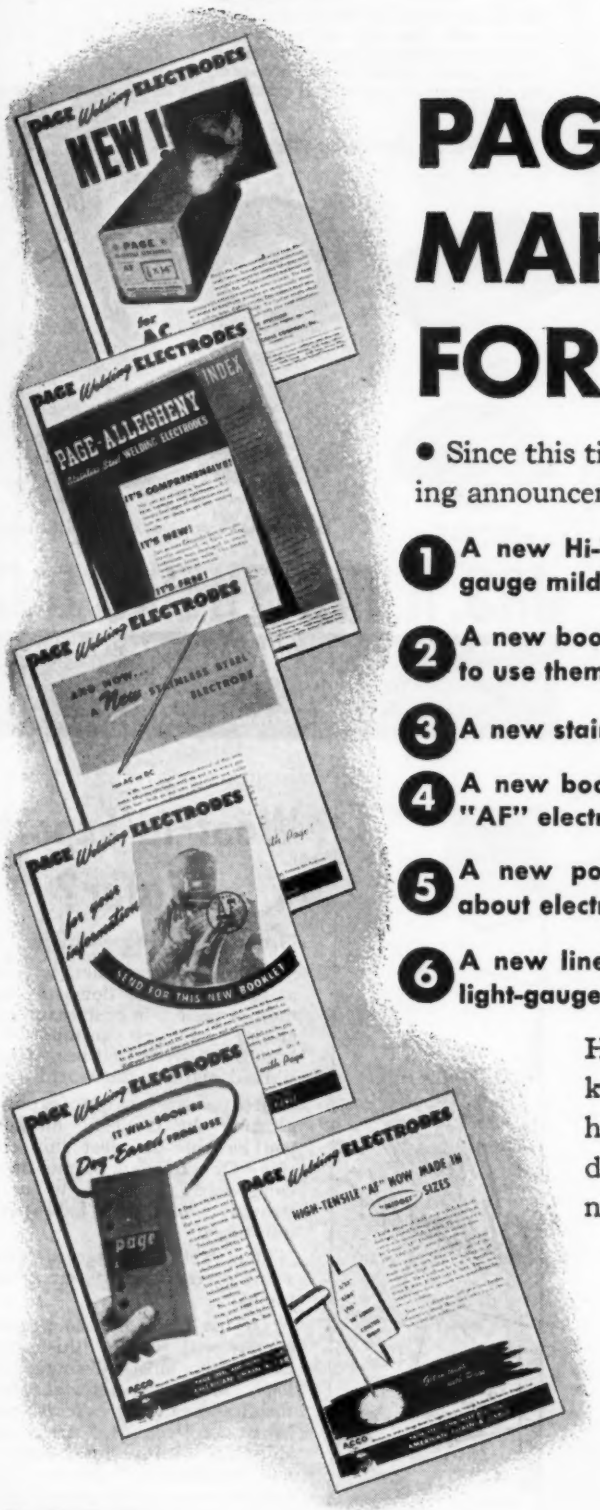
Send for your AO Respirator Guide—showing proper protection against more than 140 respiratory hazards.

American Optical

COMPANY

SOUTHBRIDGE, MASSACHUSETTS

PAGE *Welding* ELECTRODES



PAGE *Keeps On* MAKING NEWS FOR WELDERS

• Since this time last year, PAGE has made the following announcements to the welding industry:

1. **A new Hi-Tensile "AF" electrode for welding light-gauge mild steel, using AC or DC.**
2. **A new book about stainless steel electrodes and how to use them for best results.**
3. **A new stainless steel electrode for AC or DC.**
4. **A new book of information on the use of Hi-Tensile "AF" electrodes.**
5. **A new pocket-size manual of general information about electrodes and their use.**
6. **A new line of "midget" electrodes for welding very light-gauge mild steel.**

Here is tangible evidence that PAGE is keeping up with the times. For uniformly high quality electrodes and for up-to-date information about welding techniques, it will pay you to . . .

Get in touch with Page!

ACCO

Monessen, Pa., Atlanta, Chicago, Detroit, Denver, Los Angeles, New York, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

ACCO TRADE MARK

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Air Express speeds the day she'll listen to HER NEW RADIO

Yes, as industry races against time to make more and more radios, irons, washing machines and other goods the public wants and needs, Air Express is helping to get them faster.

Here's how. When a plant makes production changes, new tools, dies, machinery and parts are needed *fast* — critical material that is obtained via Air Express in a matter of hours. With such delivery speed, industry as a whole is gaining millions of man-hours in getting consumer goods back on the market and into the home.

Specify Air Express-a Good Business Buy

When time means man-hours saved, production gained, a customer made — Air Express "earns its weight in gold" as thousands of firms, large and small, have learned.

Shipments travel at a speed of three miles a minute between principal U.S. towns and cities, with cost including special pick-up and delivery. Same-day delivery between many airport towns and cities. Rapid air-rail service to 23,000 off-airline points in the United States. Service direct by air to and from scores of foreign countries.

TYPICAL RATE CHART

AIR MILES	2 lbs.	5 lbs.	25 lbs.	40 lbs.	Over 40 lbs. Cents per lb.
149	$1.00	$1.00	$1.00	$1.40	3.5
349	1.06	1.35	2.63	4.20	10.5
549	1.11	1.52	4.38	7.00	17.5
1049	1.36	2.19	8.75	14.00	35.
2349	1.65	4.03	20.13	32.20	80.5
Over 2350	1.68	4.20	21.00	33.60	84.

AIR EXPRESS

AIR EXPRESS GETS THERE FIRST

Write Today for "Jig Saw Puzzle," a booklet packed with facts that will help you solve many a shipping problem. Air Express Division, Railway Express Agency, 230 Park Avenue, New York 17. Or ask for it at any Airline or Express office.

Phone AIR EXPRESS DIVISION, RAILWAY EXPRESS AGENCY
Representing the AIRLINES of the United States

MARKING MACHINES

STEEL DIES—TYPE AND FIXTURES

Matthews marking machines, dies, type and fixtures supplied for marking names, codes, trade names, trade marks, patent numbers, etc., on all types of industrial parts or products.

Write for literature

Flat Die for Marking Round Parts

No. 324 Marking Machine

Round Die for Marking Flat Parts

Roller Die with Interchangeable Type

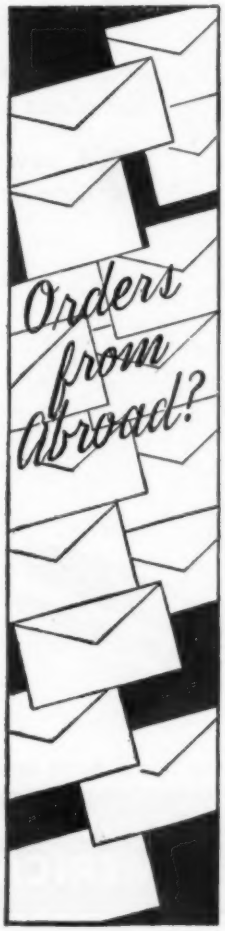
JAS. H. MATTHEWS & CO.

3956 FORBES STREET PITTSBURGH 13, PA.

BRANCH PLANTS

NEW YORK BOSTON CHICAGO PHILADELPHIA NEWARK SYRACUSE

District Sales Offices: Cleveland, Hartford, Birmingham



Want to Export... Later?

"Later" may be too late! !

Some countries are already exporting at the expense of domestic markets, though their domestic markets could absorb anything produced. Their brands are welcomed in merchandise-starved markets the world over.

When you are ready to export, after glutting the domestic market, will you be able to meet this competition? Or will your brands be unwelcome and unknown to a people strongly under the "habit-purchase" influence?

It may well be wiser to allocate a small percentage of your production for export, *now.*

Accreylon Company, as export managers, will divide this allotment among the most advantageous markets. Our service relieves you of all details—financing, credit responsibility, collections, merchandising, shipping, billing, local laws, tariffs and regulations. Purchases are made for our own account; re-selling abroad is on our own responsibility.

We charge no fee.

Accreylon solicits your inquiries, and will welcome the opportunity to place our export-market "know-how" at your service.

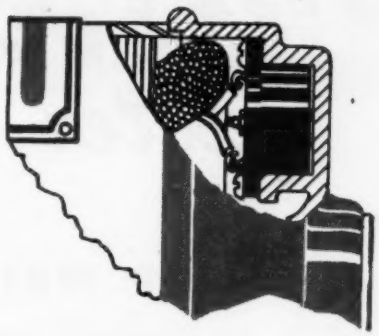
ACCREYLON COMPANY
DEPT. B-11
130 West 42nd Street New York 18, N.Y.

Reduced Expense Accounts for Motors with Built-in KLIXON MOTOR PROTECTORS

Electric motors equipped with built-in Klixon Protectors . . . are trouble-free motors. Why, because Klixon Protectors prevent motors from becoming overheated and burning out. Low in cost, they quickly pay for themselves by practically eliminating motor repairs and replacements and minimizing production delays.

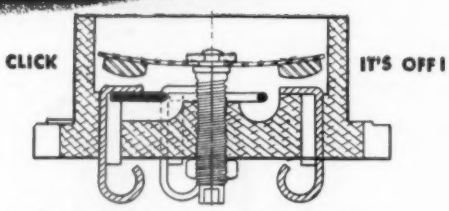
Because they are built into the motor by the motor manufacturer, Klixon Protectors are matched exactly to the motor assuring a proven and tested combination of motor with adequate protection. Yet, Klixon Protectors never unnecessarily interfere with the normal operation of motors . . . . always permit maximum operating capacity.

Always insist on built-in Klixon Protectors with every motor you buy. They are available for A.C. motors all sizes; D.C. motors up to 30 volts. Write for Bulletin PR-112.

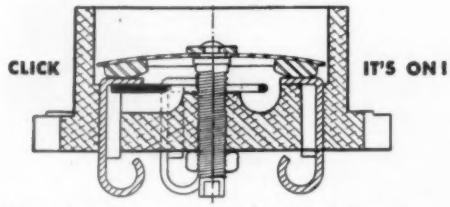


AUTOMATIC RESET

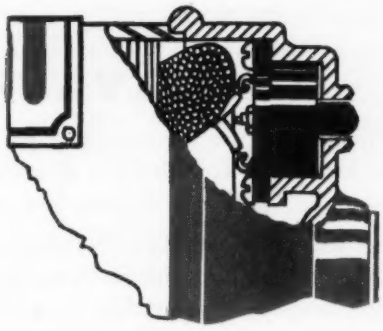
Automatic reset types are recommended for all applications except those where unexpected starting may cause injury. Examples of automatic reset applications are refrigeration, air conditioning, air compressors, blowers, and any unattended or automatically controlled equipment.



Should a motor become overheated and dangerously hot, the Klixon Protector snaps the power "off" preventing the motor from burning out.



When the motor cools to safety, the Klixon Protector snaps the power "on" automatically if the automatic reset is specified . . . *or when the reset button is pushed when manual type is specified.*



MANUAL RESET

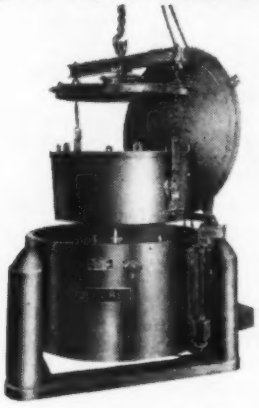
The manual reset type should be used for those applications where hazard is involved in an unexpected starting of the motor, such as washing machines, hand tools, power saws, machine tools, irons, etc.

SPENCER THERMOSTAT COMPANY KLIXON **ATTLEBORO, MASSACHUSETTS**

Spin off OIL, SOLVENTS, EXCESS SPELTER, ETC. FROM YOUR SMALL METAL PIECES

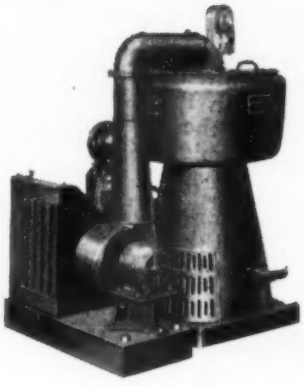
faster . . . more economical

CHIP WRINGERS



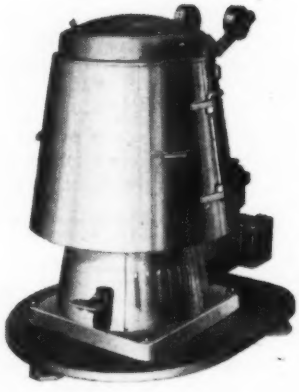
Tolhurst Chip Wringers are available in two types. The "Solid Curb" is available with a 20" or 26" basket. Capacity 1¼ cu. ft. in 20" and 2½ cu. ft. in 26". Equipped with anti-friction bearings. The "Center-Slung" model is a heavy duty open-top wringer. Basket diameters are 40" and 48". Capacity 8.7 cu. ft. in 40" and 14.8 cu. ft. in 48". Basket suspension principle permits operation with unbalanced loads. Approved safety features.

METAL DRYERS



Drying small metal articles with Tolhurst Centrifugal "Metal Dryers" is standard practice. Parts to be dried are placed in a removable perforated basket. Centrifugal force and hot air dry the load in two to three minutes. Eliminates use of sawdust. Standard basket sizes: 20" and 26". Dump bottom basket saves labor, speeds drying. Available with vertical motor drive. Equipped with anti-friction bearings and approved safety devices.

GALVANIZERS



Equally effective for tinned or galvanized parts. "Spins off" excess spelter from batches of small parts in as little as two seconds. Coating is regulated by accelerating rate.

Baskets are removable. Standard size basket 16" diameter. Outer casing of machine is constructed so that "slingings" may be quickly removed for remelting. Can be furnished with wound rotor motor for varying acceleration rates for light or heavy parts.

Tolhurst Centrifugals are backed up by more than 90 years' experience in the designing and building of centrifugals. Tolhurst Sales Engineers are conveniently located in principal cities. If you have a process problem that might be solved by centrifugal force, describe it in a letter. Write today! Address nearest district office.

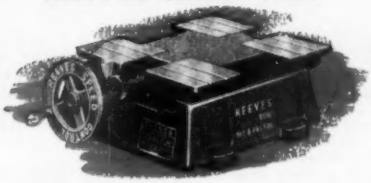
NEW YORK CHICAGO | BOSTON PHILADELPHIA | WASHINGTON, D.C. ATLANTA | CLEVELAND DETROIT | KANSAS CITY DALLAS | ST. LOUIS MINNEAPOLIS | SAN FRANCISCO LOS ANGELES

TOLHURST CENTRIFUGALS DIVISION

American Machine and Metals, Inc., East Moline, Illinois

How to convert any standard constant speed motor to a Low Cost *Stepless Variable Speed Drive*

1 **Mount Your Motor on This REEVES Motor Base**



Base is built in wide range of sizes to fit any standard constant speed motor up to 15 h.p. Includes sliding platform and handwheel for moving motor forward or back.

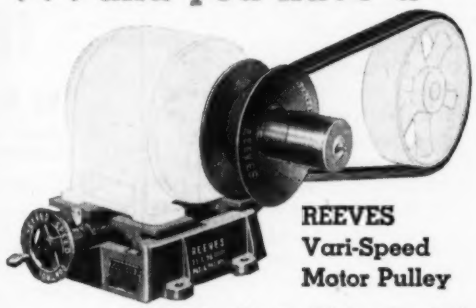
2 **Apply This Disc Assembly to Motor Shaft**

Assembly consists of two facing cone-shaped discs, one stationary, the other sliding laterally, and compression spring for mounting on extension shaft of motor.

3 **Connect to Driven Machine With This Special V-Belt**

Place specially designed REEVES V-belt between discs and over pulley on power input shaft of the driven machine. Adjust belt to minimum center. Anchor motor base.

. . . and you have a



REEVES Vari-Speed Motor Pulley

available in sizes to 15 h.p. for stepless speed adjustability within 4:1 range.

HOW IT WORKS: The operation of a REEVES Motor Pulley is extremely simple—yet it follows the time-tested REEVES principle of a V-belt traveling between the adjustable driving diameters of cone-shaped discs. By turning handwheel, motor is moved forward or back on base, varying the driving diameters of the discs. As motor is moved toward driven machine, belt rides higher between discs, thus increasing the speed transmitted. Turning handwheel in opposite direction reverses the operation. Any speed within range is accurately maintained.

WHAT YOU CAN DO WITH IT: The REEVES Motor Pulley is the simplest dependable method of providing infinitely variable speed adjustability to a driven machine. With this low-cost, easy-to-install equipment you can transform a machine with fixed speeds into a far more versatile production unit—one that is instantly responsive to every changing condition and work schedule. Install REEVES Motor Pulleys on your machines in service, and when you buy a new machine, look for the familiar REEVES handwheel that signifies REEVES-equipped.

SEND FOR THIS CATALOG

New, 96-page book gives complete information on this and the two other basic REEVES Speed Control units—the Variable Speed Transmission and the Motodrive. Ask for Catalog AM-450.

REEVES PULLEY COMPANY, COLUMBUS, INDIANA

Recognized Leader in the Specialized Field of Speed Control Engineering

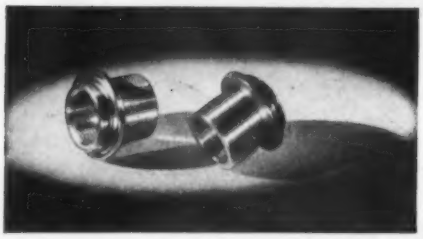
Accurate Variable

REEVES Speed Control

Gives the Right Speed for Every Job!

PRECISION PARTS

"SEE" FOR SEA DOGS



"... from print to product"

A lens-mount is a very necessary part of sound-detection equipment. And, like the hundreds of other equally necessary parts which make up the complete unit, it must be turned out with truly engineered precision to assure perfect operation . . . hairline efficiency.

Ace turned-out this particular part from print to finished product. From stainless-steel bar-stock, Ace machined the blank, tapped a fine-class thread, and thread-ground the O.D. on both sides of the flange, concentric to the inside tapping. Delicate precision . . . accuracy throughout. The entire part was checked on go and no-go gauges again and again throughout each operation to insure concentricity.

Ace is a pioneer in this ever-increasing accuracy which industrial demands have taught to mass-production. Here, under one roof, is a source of supply for small parts or assemblies which call for stamping, machining, heat-treating, or grinding. And Ace offers the modern ingenuity and carefully controlled production you need in current peacetime conversion. Send sketch, sample, or blueprint for quotation.

Capacity open in threads

ACE

TRADE MARK

ACE MANUFACTURING CORPORATION

for Precision Parts

1207 E. ERIE AVENUE, PHILADELPHIA 24, PA.

Get the facts on line production

for precision, quantity, low cost in small industry

This book gives you the fundamentals of production line technique—how it differs from job-lot manufacture, its advantages and limitations, how production lines may be set up and successfully operated in medium-sized industries. Based on first-hand field investigations of current practices in many manufacturing plants. A sound, practical guide to the steps to follow in design, procedure equipment, and maintenance of production lines . . . the pitfalls to avoid . . . and the special features to consider, in establishing smooth-running well-balanced, *profitable* production lines.

PRODUCTION LINE TECHNIQUE

By RICHARD MUTHER

Department of Engineering Administration, Massachusetts Institute of Technology

320 pages, 113 illustrations, $3.50

First-hand experience and observation of procedures both here and abroad make this book a mine of practical information on design and process engineering, layout and equipment, line balance and flow of material, production controls, and flexibility of layout and equipment. Fully illustrated by actual examples and procedures. Shows in detail how to establish and maintain line production in a variety of industries—to get the smooth, balanced line, steady flow of material, and effective use of men and materials essential for low cost, high volume, precision production.

ERWIN H. SCHELL, says in the foreword: "... objective and penetrative . . . organized for the express purpose of assisting in the practical application of these procedures to the medium-sized establishment."

This book brings the principles and application methods of this fast, steady controlled technique of *paced production*—proved so vitally important in the war effort—within the reach of the small-plant manufacturer. There will be an ever-increasing demand for precision products at lower cost—be prepared, now, with the facts on this dynamic stream-lined technique.

See it 10 days—Mail this coupon!

McGraw-Hill Book Co., 330 W. 42nd St., N. Y. C. 18

Send me Muther's Production Line Technique for 10 days' examination on approval. In 10 days I will send $3.50 plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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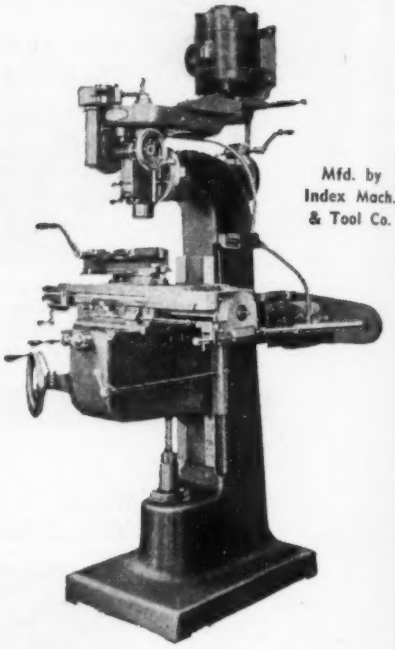
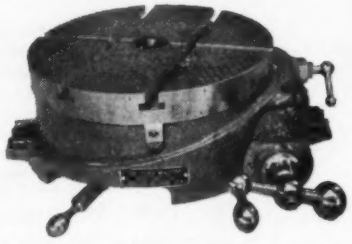
INDEX MILLS

will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



Mfd. by Index Mach. & Tool Co.

12" Tool Room Rotary Table



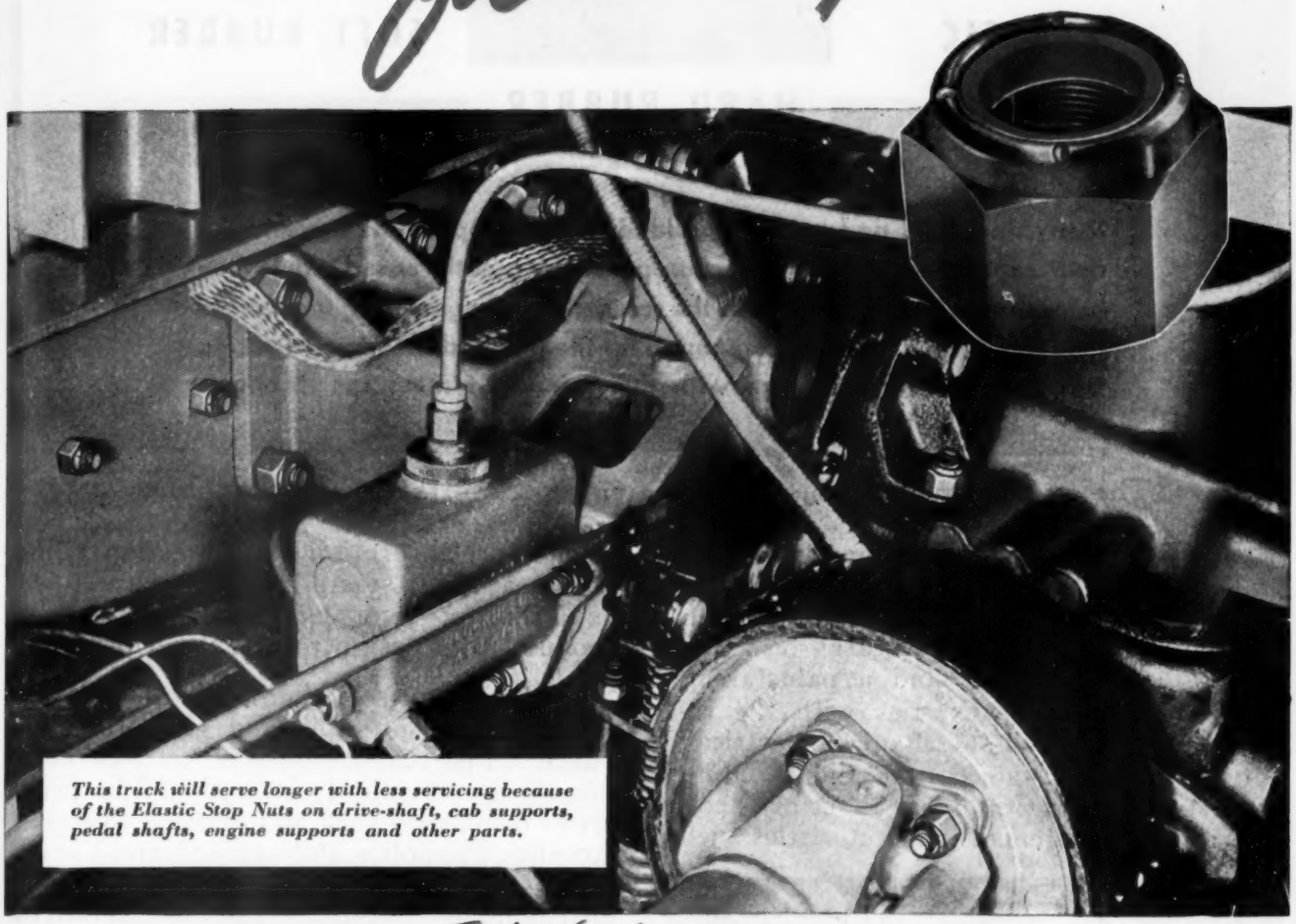
A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

BLANK and BUXTON MACHINERY

3100 E. MICHIGAN AVE.
JACKSON, MICH.

HERE'S THE HEADLINER *for holding power*



This truck will serve longer with less servicing because of the Elastic Stop Nuts on drive-shaft, cab supports, pedal shafts, engine supports and other parts.

THE ELASTIC *Self-Locking* STOP NUT USES ITS HEAD

Making headline news among sales executives the country over is the Elastic Self-Locking Stop Nut, the nut with the famous red collar.

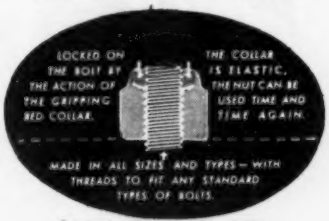
For sales executives are quick to recognize top-merit features that add sales appeal and widen public acceptance. The nut with the red collar, the hold-fast nut, adds value to trucks, passenger cars, vacuum cleaners, lawn mowers, radios and a host of other things because it assures longer, trouble-free service.

In industry, in the home, in office, factory and on the farm, red-collar nuts are finding thousands of new applications—holding fast wherever vibration, shock, impact or other loosening influences could cause trouble of any sort, from individual annoyance to multiple fatalities. They simply won't come loose. Not until you take a wrench and deliberately remove them. Then they turn off readily, for the metal threads are sealed-free of rust.

Tough and resilient, the red collar is unthreaded and gauged slightly smaller than the bolt. Bolt threads force their way in, do not cut, and a friction grip is set up. This overcomes the effects of vibration and other loosening forces—and because the collar retains its gripping power, the nuts may be used over and over again.

An application engineer will be glad to call on you and discuss ways Elastic Self-Locking Stop Nuts can help you.

LOOK FOR THE RED COLLAR
THE SYMBOL OF SECURITY


LOCKED ON THE BOLT BY THE ACTION OF THE GRIPPING RED COLLAR.
THE COLLAR IS ELASTIC. THE NUT CAN BE USED TIME AND TIME AGAIN.
MADE IN ALL SIZES AND TYPES—WITH THREADS TO FIT ANY STANDARD TYPES OF BOLTS.

ESNA
TRADE MARK

ELASTIC STOP NUT CORPORATION OF AMERICA
Union, New Jersey

Which material is best for your molded part or product ?

PLASTIC

SOFT RUBBER

HARD RUBBER

Many designers and users of molded parts and products have found their experimental and production problems greatly eased when they have chosen a molder who has the research and engineering facilities to help them select the right compound for the job, and the manufacturing facilities to follow through with deliveries that meet specifications.

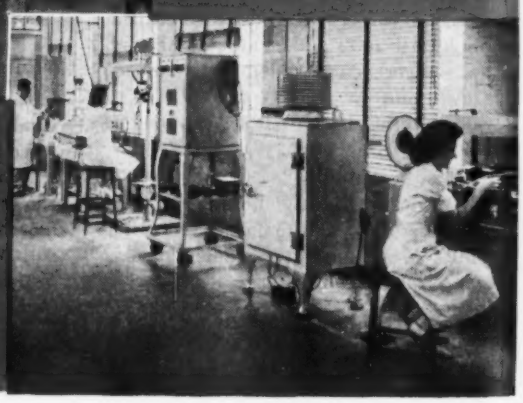
The importance of selecting the right material . . . and molder

Selecting the right material is the first serious problem to be overcome after preliminary drawings of a part or product have been made. It involves careful research on all of the materials available and a painstaking matching of their properties with the requirements of the job. Mechanical, electrical, optical, thermal, fabricating and molding properties; stability and the effect of chemicals, and those general characteristics such as moisture absorption, solvent action, aging and weathering, taste and odor have to be explored for their effect on the part or product from design to actual performance.

The problem of selection is not an easy one in these days of rapid and glamorous advance . . . particularly in plastics. New compounds are constantly emerging. The properties of plastics such as Cellulose Acetates, Acrylics, Phenolics, Polystyrene, and Vinyls, for instance, differ a great deal. Research on rubber is continuing and new synthetic

LABORATORIES OF VULCANIZED RUBBER & PLASTICS CO.

PHYSICAL RESEARCH AND TESTING: Largely responsible for the close tolerance work we have been able to maintain both on government and civilian work, this physical laboratory has all the modern equipment for the research and quality control your product requires.



MODERN EQUIPMENT: The microphotography equipment illustrated above is typical of the "tools" our engineers use for testing purposes.

CHEMICAL RESEARCH AND TESTING: In this modern, fully equipped laboratory our trained staff tests materials for adherence to your specifications; and continual research is carried on to find a better material for your product.

formulas are being developed. When natural rubber is available in quantity again, we will have a still greater range of compounds.

From appearance to performance, the proper material depends on the job your part or product has to do. A plastic, hard or soft rubber, a metal, or a combination of two or three of them may be best.

Complete Service

Here at the Vulcanized Rubber and Plastics Company, we have the chemical and physical research and testing laboratories and staff to help you find that right material. And we have a wealth of experience in fabricating molded forms. Starting over sixty years ago with hard rubber, one of the first plastics, we have constantly sought to convert any new development in plastics to the mutual benefit of our customers and ourselves.

Our engineering staff will be glad to help you

Just tell us where your part or product goes to work or give us the drawing and specifications. If we should find that the part or product doesn't belong, economically or physically, in any one of the wide range of plastics, hard rubber, soft rubber, or molding methods that we are set up to handle, we will frankly say so and recommend what we think is best. If you would like to have an engineer call to discuss your application, please write Dept. A.

Vulcanized Rubber and Plastics Company

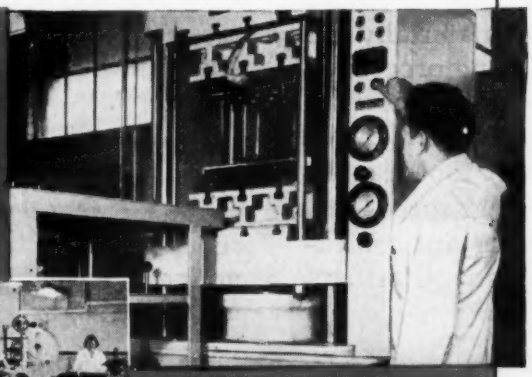
formerly The Vulcanized Rubber Company

Manufacturers of Rubber and Molders of Plastics

General Offices: 259 Fifth Avenue, New York 16, New York Works: Morrisville, Penna.

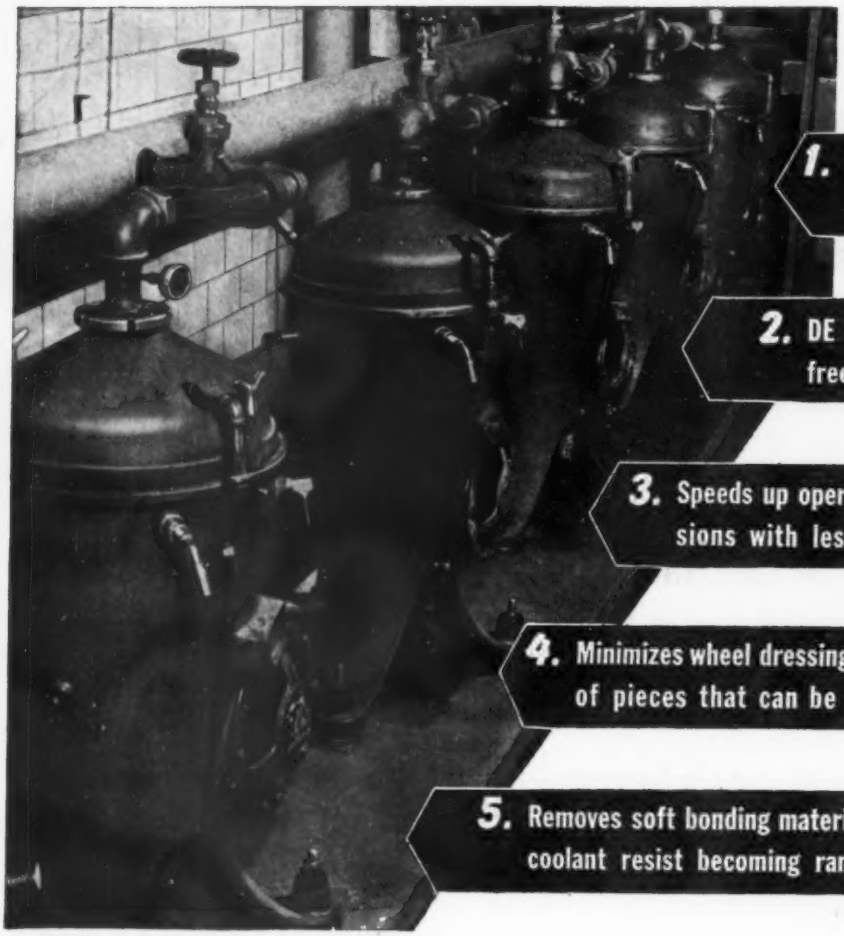
Plastics? Fine. But are you sure Hard or Soft Rubber won't do it better?

Just as it made sense for us, with our molding experience, to go into the new plastics, it also made sense to continue our research and fabricating on the older plastics . . . hard and soft rubber. In many applications rubber works far better than any of the new plastics. For instance, in water meter applications, none of the new plastics have the over-all properties of hard rubber, particularly the dimensional stability and high resistance to moisture and solvents, that would enable them to be used as universally. The same reasons hold true for its choice in many applications in the electrical field where it withstands submersion and exposure to gases much better than newer plastic materials.



FABRICATING AND MOLDING DATA: On up-to-date laboratory equipment like this 150 ton fully automatic hydraulic press the best method for your part or product is determined. In this versatile machine, research on compression and transfer molding is done on both plastics and rubber compounds.

QUALITY CONTROL: Section of the semi-scale plant in our laboratory which duplicates the machines in our plant, where continual research to improve the fabricating method of your part or product is carried on and materials tested for behavior under operating conditions.



1. DE LAVAL "Hermetic" Clarifier handles all types of oil and aqueous coolants.

2. DE LAVAL Clarifier keeps grinding coolant free from abrasive and metallic sediment.

3. Speeds up operations—can grind nearer finish dimensions with less likelihood of distorting the work.

4. Minimizes wheel dressing; prolongs wheel life. Increases number of pieces that can be ground per each dressing of wheel.

5. Removes soft bonding material as well as metallic particles—helps coolant resist becoming rancid and reduces hazard of infection.

DE LAVAL Coolant Clarifiers SPEED Grinder Output...

DE LAVAL Coolant Clarifiers, which by centrifugal force keep grinding coolant clean, cut down materially on the time required for finishing processes. They reduce the likelihood of distorting work; they also reduce grinder maintenance and loss of time for tool set ups. Wherever greater grinding speed and better finish are most important considerations, De Laval Coolant Clarifiers soon pay for themselves.

De Laval "Hermetic" Coolant Clarifiers feed and discharge the liquid under pressure, eliminating foaming. The coolant can be pumped back directly to the work.

These advantages are basic. Every factory that has a centralized grinding system can enjoy them. A De Laval representative will be glad to discuss your layout with you, without obligation. Send for Bulletin FG-17.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19
THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

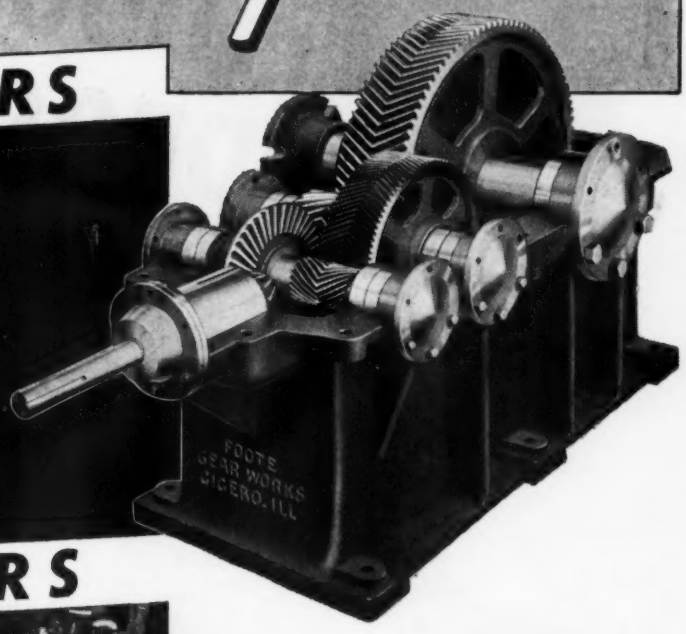
De Laval

"Hermetic" COOLANT CLARIFIERS

Brad Foote Gears
FOR
SPEED REDUCERS

RATIOS

HERRINGBONE	2:1 to 295:1
WORM	3⅝:1 to 60:1
GYRO	16:1 to 30,000:1
SPUR	2:1 to 40:1
VERTICAL HELICAL	2:1 to 80:1
SPIRAL BEVEL	1:1 to 5:1
PLANETARY	4:1 to 400:1
OIL WELL UNITS	12:1
LITTLE GIANT	28:1



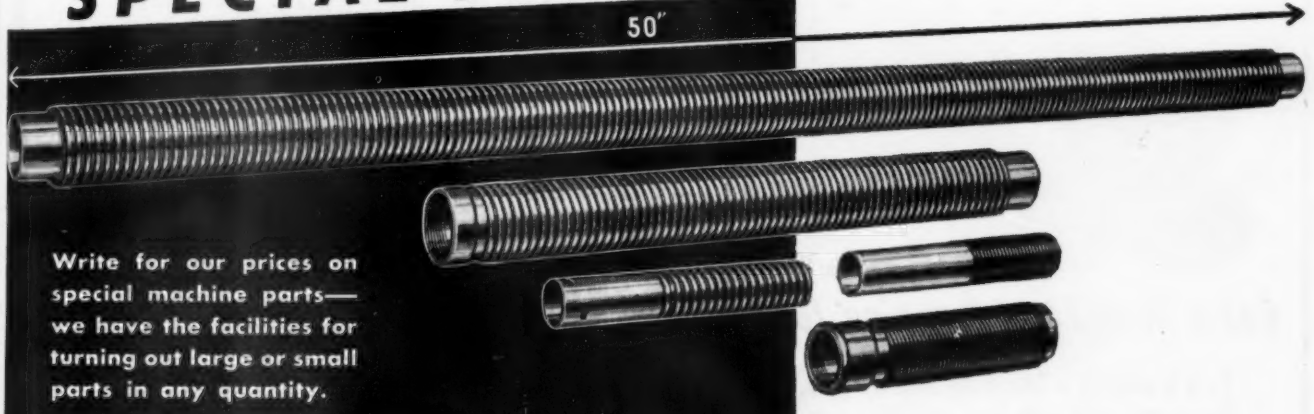
SPECIAL GEARS

Brad Foote diversified and extensive equipment permit the manufacture of all types of special precision cut gears.

Bevels, Straight, Spiral or Mitre, Spur, Herringbone, Helical are made at Brad Foote in any practical size from any practical material.

Gears are under constant inspection and close control and prompt deliveries may be made in any proportion.

SPECIAL PARTS



Write for our prices on special machine parts—we have the facilities for turning out large or small parts in any quantity.

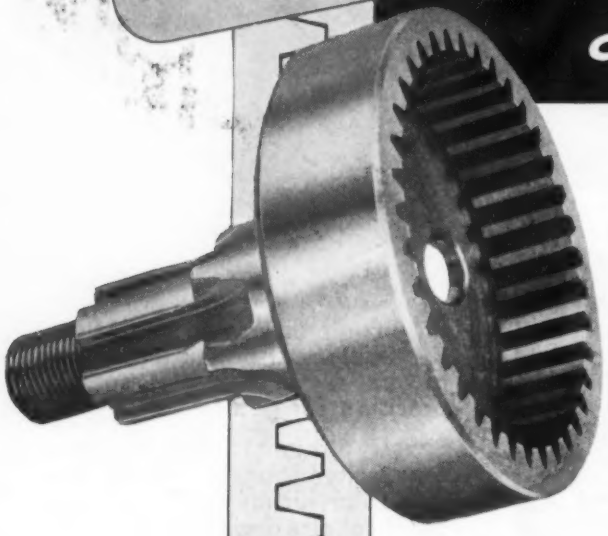
ARMY E NAVY

BRAD FOOTE GEAR WORKS

1309 SOUTH CICERO AVENUE
Department P
CICERO 50, ILLINOIS

Are you TOUGH ON SPECS?

Let's talk it over



You can count on maintaining quality and deliveries both, when you turn over your gear jobs to Sier-Bath. We maintain accuracy and quantity with the finest battery of shapers, generators, finishers and shavers in the East. To meet your tolerances, even when as close as .0001," we have automatically controlled hardeners and constantly calibrated gauges. Our skilled mechanics are the kind attracted by clean, bright, comfortable plant conditions. Call us today, then let a sample order do our talking.

SIER-BATH GEAR COMPANY, Inc.,
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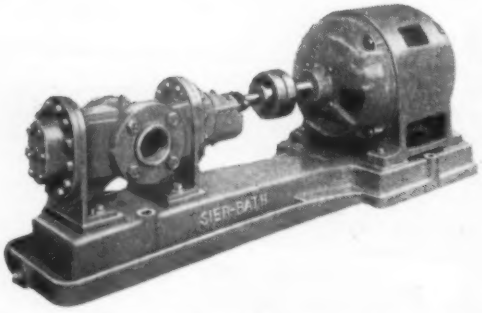

Got a Thick Fluid Pumping Job?

Turn it over to a Sier-Bath Screw Pump, the pump with only two moving parts. Complete data sent upon request.

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Precision Gears *in Production Quantities*

● The dam has broken! The starved civilian market is clamoring for the products it has been long denied!

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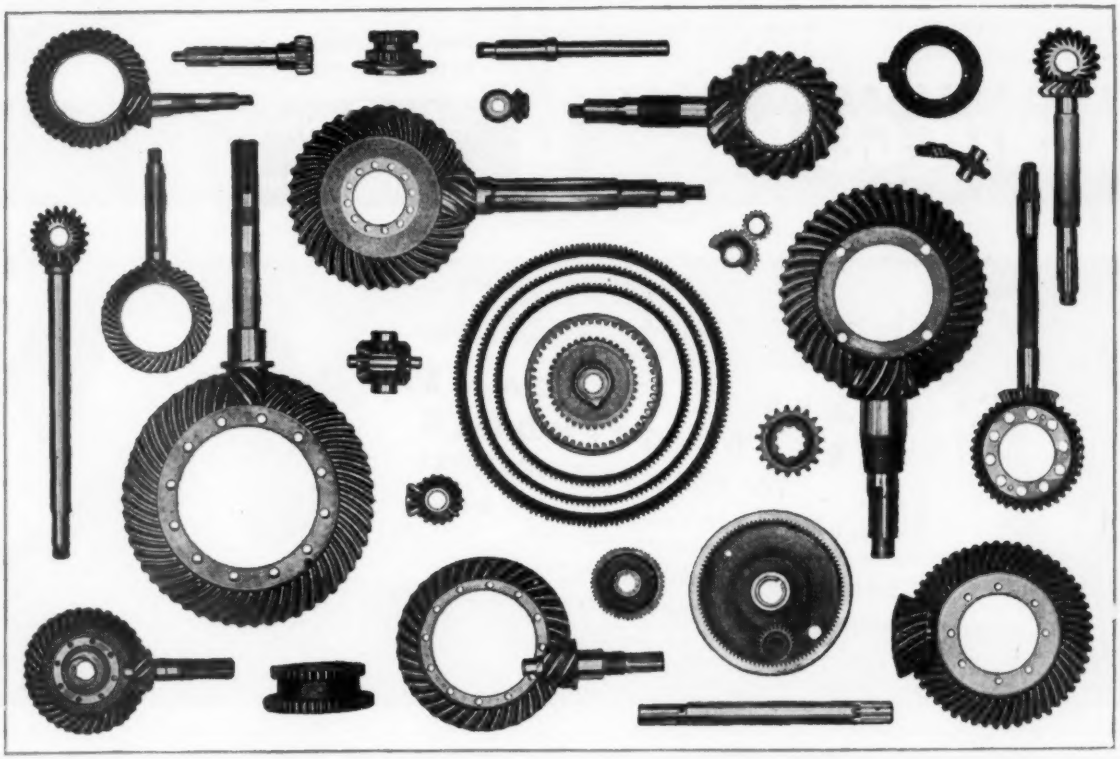
Automotive Gear specializes in **BEVEL GEARS,** spiral, straight, hypoid and zerol tooth; **FLYWHEEL RING GEARS; SPUR GEARS,** internal and external, straight and helical; and **GEAR SHAFTS.**

* * *

Your inquiries are solicited—and always given prompt and careful attention.



Bevel Gears (SPIRAL, STRAIGHT, HYPOID, ZEROL) . . . **Spur Gears** (STRAIGHT AND HELICAL)
Flywheel Ring Gears . . . Gear Shafts

DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS INC.

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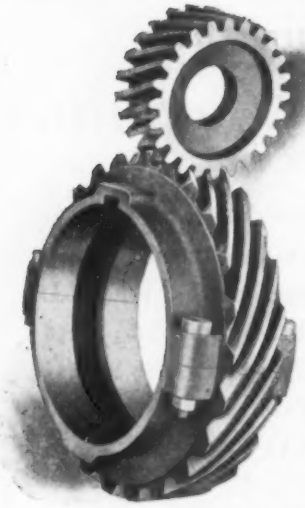

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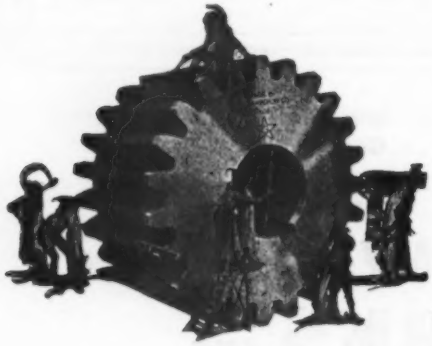

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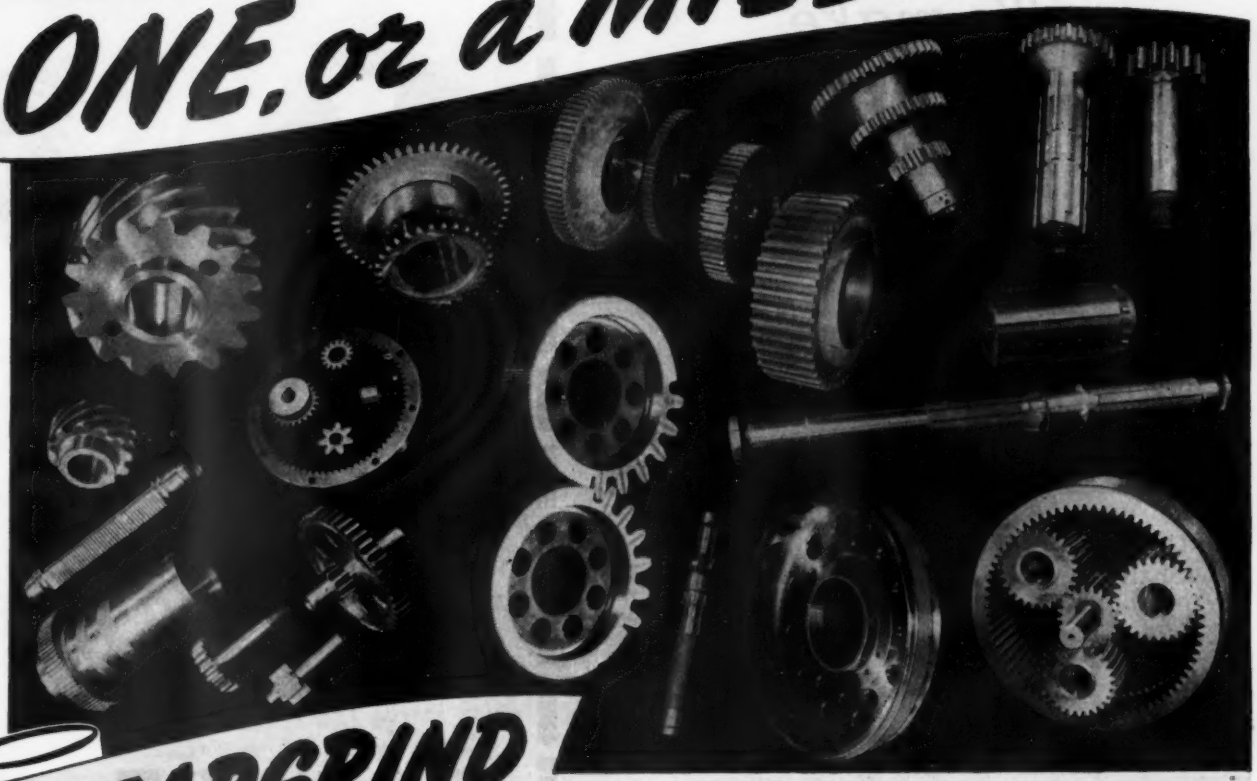

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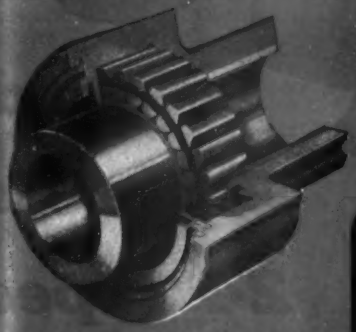

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From ½" to 33" O.D. 1¼ to 64 pitch. Pinion gears up to 60" between centers. Any desired pressure angle.

Internal Involute Spur Gears and Splines

From 2½" to 17" P.D. 4 to 64 pitch. Maximum face width 5". Any desired pressure angle. Number of teeth up to 200. Maximum O.D. 26". V shaped Splines of any included angle.

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We have limited facilities for grinding this type gear.

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Lengths up to 26". Width of work up to 4". From 3 to 32 pitch. Any desired pressure angle.

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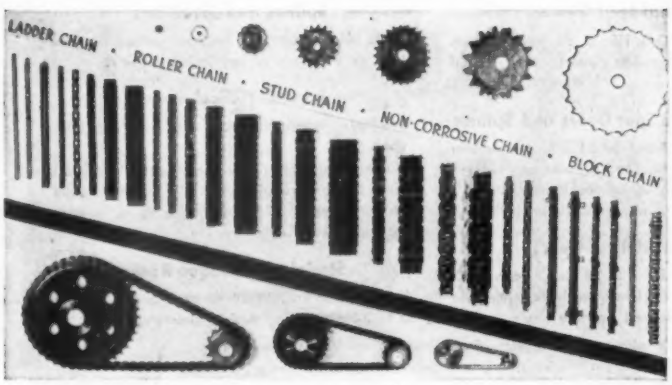
Gears – all Types

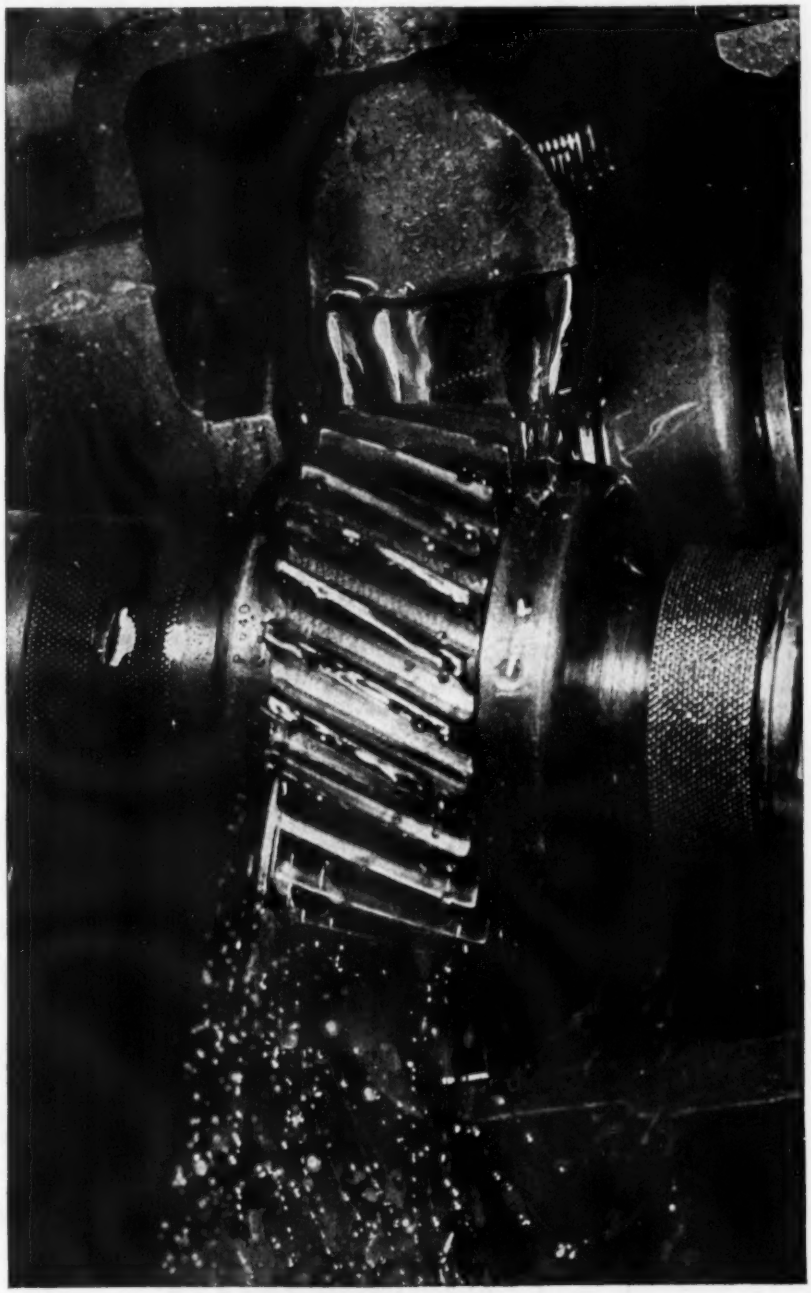


Chain and Sprockets both Ladder & Roller

Speed Reducers 24 Types

Specify S/V Sultran Cutting Oils for...

GEAR SHAVING ACCURACY AND FINISH!



WHERE GEAR SHAVING is employed to obtain superior finish and great surface accuracy with greatest economy, it pays to get additional cutter protection from the highest quality cutting fluids that you can buy.

You can get this protection with S/V Sultran cutting oils. In many shops across the country, these outstanding oils are proving their superiority in protecting gear shaving cutters. Here's why:

S/V Sultran cutting oils possess exceptional oiliness properties, the characteristic most needed for gear shaving operations. Operators who are using them report that they are obtaining phenomenal cutter life despite the naturally abrasive action of minute chips on the hundreds of cutting edges on each cutter.

For gear shaving and for other precision machining, be sure to specify S/V Sultran oils. Your Socony-Vacuum Representative will help you select and apply the exact cutting fluid for your individual job.

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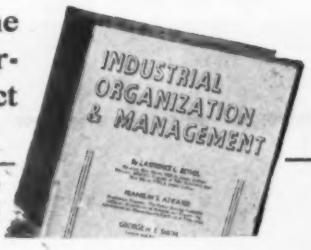

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HERE is a book which provides you with the latest used and tested processes for every management function—from the planning and financing of the enterprise to actual work methods in the shop. Now you have a chance to see right inside the organization of dozens of big industries throughout the country, and learn from their case histories, from shop practice and management experience, the most successful methods in operation today.

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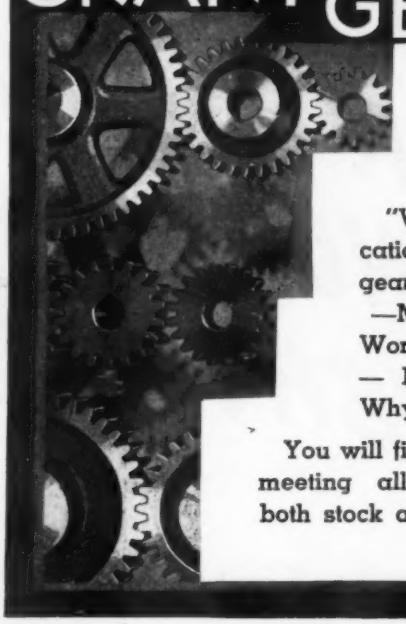

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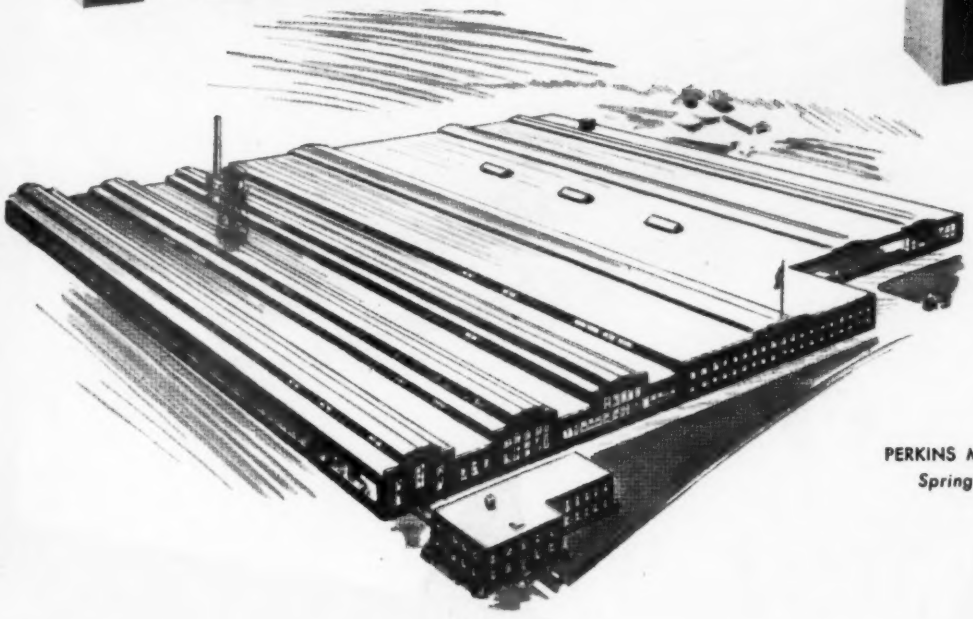

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Springfield, Massachusetts

COMPETITION for post-war markets is now in full swing. Products having the "edge" in quality will—as always—capture the major share of their respective markets.

In our modern plant at Springfield, Mass., we have the men and machines to mass-produce precision gears to your specifications, *and complete satisfaction.* LET'S GET TOGETHER NOW AND WE'LL PROVE IT TO YOU.

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This manufacturer had always made its own stampings, and had tooled up to produce the steel ribbon cover shown above. Difficulty was experienced in providing enough metal for the rear overhang without wrinkling the top surface. So Presteel was called into the picture, and—as usual—solved the problem.

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REGULATIVE PRESSING SPEED PORTION OF STROKE (20 to 200 ipm)

MANUAL OR FULLY AUTOMATIC RAM CYCLING

EACH REPEAT STROKE EXERTS EXACT PRE-SET PRESSURE

LENGTH OF REPEAT STROKES REGULATIVE .004 to ½-inch

NUMBER OF REPEAT STROKES REGULATIVE 1 to 25, automatically 1 to infinity, manually

FREQUENCY OF REPEAT STROKES REGULATIVE

RAM FOLLOWS WORK AS IT YIELDS, EXERTING EXACT PRESSURE

Vibratory HydrOILic Pressure — just *one* of many unique control features available with the amazing new MULTIPRESS — imparts any pre-set number of short, rapidly-repeated, exact-pressure strokes *upon each full downstroke of the ram!*

As shown above, these repeat strokes are regulative in length, pressure, speed, frequency, and number per ram cycle. And the ram *follows the work* downward as it yields, exerting exact pre-set pressure on each vibratory stroke.

MULTIPRESS — a completely self-contained, motor-driven, oil-hydraulic bench press, in 4 and 6-ton sizes — makes this *exactly controlled* vibratory action available at surprisingly low cost. Other MULTIPRESS accessories include automatic cycling controls, straightening fixtures, reciprocating tables, pelleting devices, automatic indexing tables, foil feeds, a variety of bolster plates, benches, extension tables, side shelves — to mention only a few. Write today for further information. The Denison Engineering Co. 1164 Dublin Rd., Columbus 16, O.

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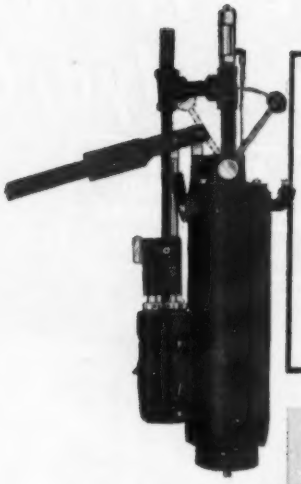
★ FINGER TIP VALVE CONTROL is opened or closed with the flip of a finger. No slow and awkward screw-type valve to fumble with. One of many KRW features that mean faster work.



★ TWO SPEED PUMP. A half turn of the winged finger lever selects the speed desired. Second speed is 2-1/2 times faster than normal action. Only on KRW Presses is this manually selected ram speed available.

THIS...

★ ONE MAN BED-SHIFTING DEVICE. The easy-to-operate KRW location plus the ratchet controlled drum make bed adjusting a simple operation. Crank stays at convenient position regardless of bed height . . . no reaching or stooping necessary.

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THIS...

NOT THIS

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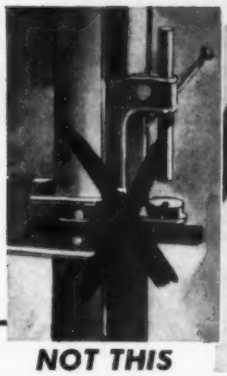

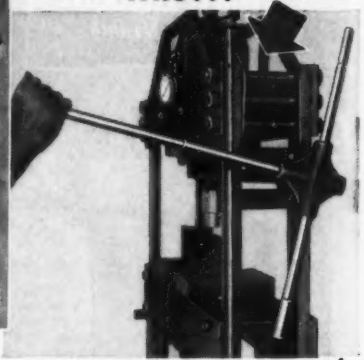

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★ CONVENIENT PUMP HANDLE LOCATION. The only correct pump handle location is slightly below a man's waist level. There's no straining to pump awkwardly, creating worker fatigue. Operator is free to watch the near-eye-level pressure gauge.

★ "BUILT-IN" MECHANICAL ARBOR PRESS. Provides the advantages of the large adjustable press bed . . . makes possible the use of V-Blocks where necessary. Hand wheel operates the ram mechanically with 3 to 4-ton pressure. You can switch to hydraulic pressure by flipping the valve control.

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STUDY THESE KRW FEATURES IN TERMS OF YOUR MANUFACTURING OPERATIONS . . . *Your profits!*

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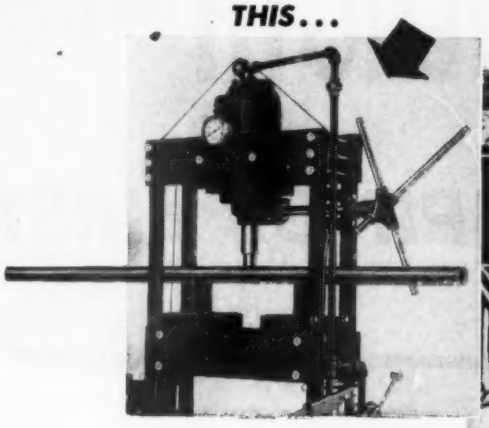

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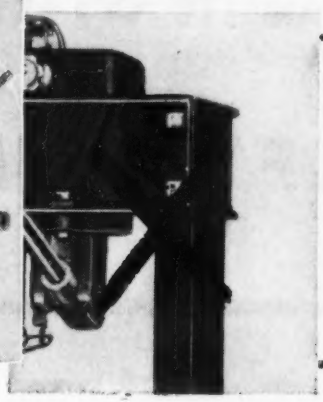

★ **OPEN ENDS FOR LONG WORK. Permits any length work to be supported on V-Blocks directly under the ram. On other presses work must be passed through diagonally. KRW Presses handle long shafts and bars without loss of speed or accuracy.**

★ **Here, on these pages, you can see the proof of KRW superiority... no other hydraulic arbor press can boast of these money-saving features. Before you buy any other make of hydraulic arbor press, check their value to you in terms of your own daily operations . . . manufacturing costs . . . employee morale . . . and Profits. Many operations that can be done easily on a KRW Press cannot be handled at all on other makes of presses. Using simple, inexpensive dies, it is possible to perform many bending, straightening, flattening, offsetting, assembling and other operations at lower cost per unit. Investigate . . . our special Hydraulic Press Catalog will give you all the facts you want. Write for it today.**

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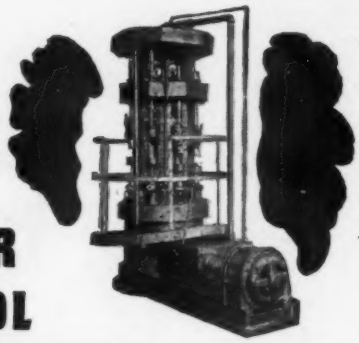

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Efficient tool designing in post war competitive production is a "must". Our experience guarantees you tools—designed for economy of operation, resulting in your increased production at a lower cost.

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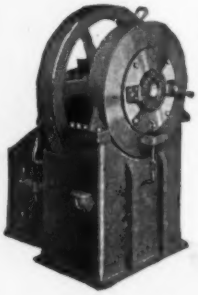

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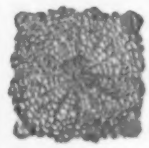
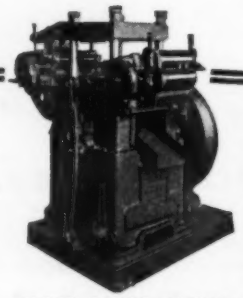
It is a fact that MANY stampings formerly considered too complicated, are today being made complete-per-stroke on Dieing Machines. Start every stamping with the premise that it can be worked out for complete-per-stroke production on progressive dies. The Dieing Machine has unique construction and does unusual things. In precision of feed and die register it is exceptional. Frequently we work out uncommon steps, such as broaching, or plan for stamping a part usually produced by machining. Savings are substantial. Dies last 600% longer on the average. Precision of product can consistently be held with a .0002" limits when needed. If your stamping CAN be made a more economical way, YOU WANT TO KNOW IT! We gladly offer every possible assistance.



Novelty jewelry pierced piece produced on Dieing Machine



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Other capacities: 10 tons to 300 tons.

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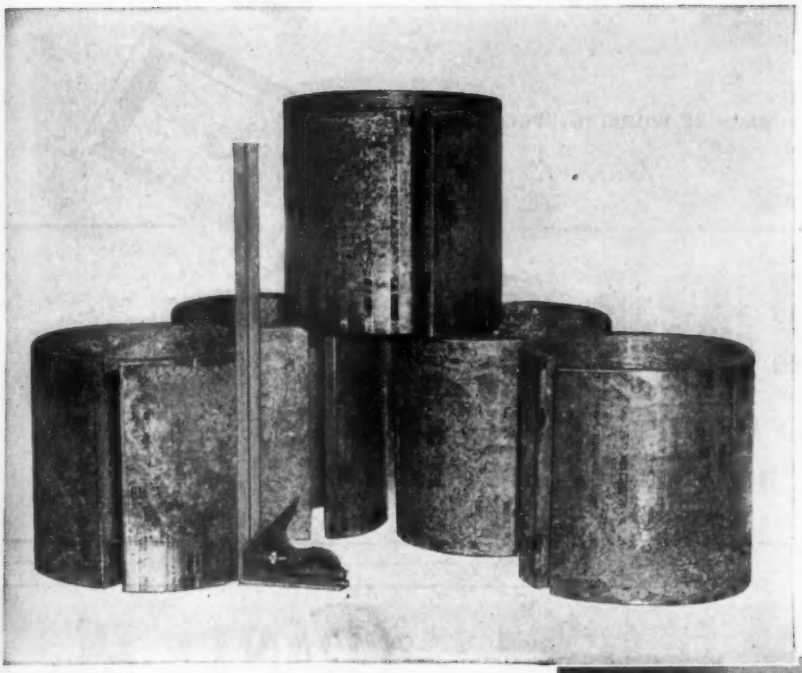
THE "EASY WAY"



● The "easy way" is the *right* way to reduce costs, in this case! "Buffalo" Wrapping Rolls provide a speedy, simple method of cold-rolling rings, gear rims, shells, small tanks and many other cylindrical shapes, formerly produced as castings, with remarkable time, trouble and cost-savings. One pass does the complete, accurate job on all but heaviest metals. At left, samples of work handled on a "Buffalo" Wrapping Roll.

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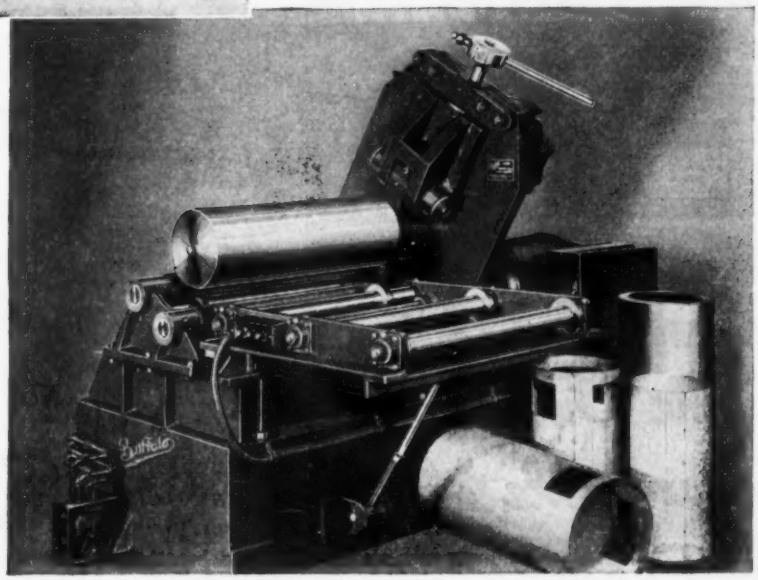

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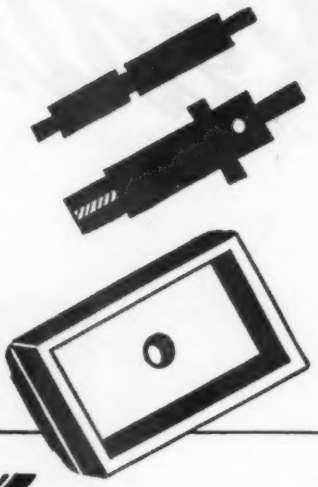

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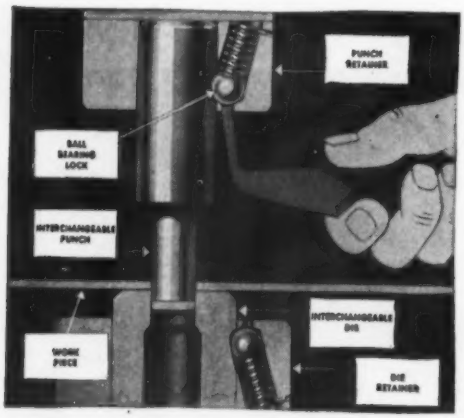

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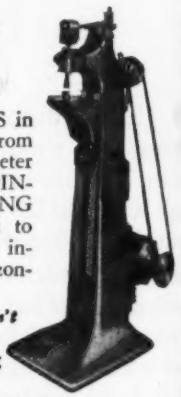

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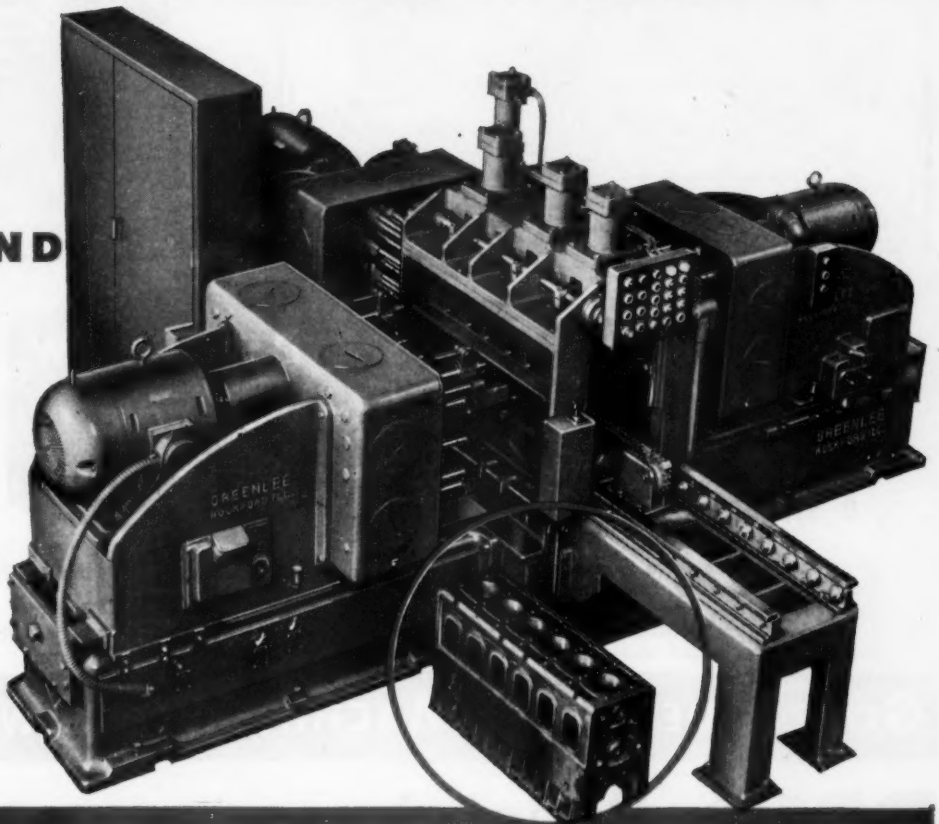
TWO MACHINES FROM A GROUP OF 6 DESIGNED AND BUILT BY GREENLEE FOR DRILLING AND TAPPING 3 SIZES OF DIESEL CYLINDER BLOCKS

This 3-way Horizontal Drilling Machine, with hydraulic loading and unloading device, drills 80 holes in the sides and front end of the 6-cylinder block shown. The machine also will drill 75

SIDES AND END

holes in a 4-cylinder block or 69 holes in a 3-cylinder block with *no machine change* other than the removal of some drills and the insertion of a few others into spindles included in the original planning of the heads. From the operator's point of view, the main feature of this machine is the ease of loading and unloading — which is all accomplished *automatically* by a hydraulically-operated transfer and clamping fixture. All he does is slide the block into place in front of the machine, push one button, and from there on the machine does everything, delivering the finished job out to the slide-off position.



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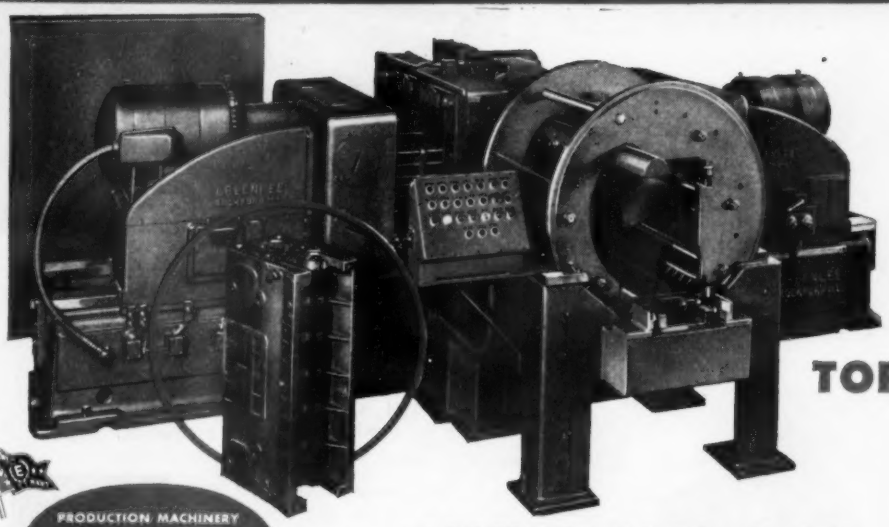

This 2-way Horizontal Drilling and Counterboring Machine, with its hydraulic loading and unloading device and turnover fixture, is very similar to the machine shown above in its flexibility and ease of operation. It takes care of 75 holes in the 6-cylinder block, 53 holes in the 4-cylinder block, or 42 holes in the 3-cylinder block with *no machine change* other than alteration of the drill arrangements in the spindles. The loading device on this machine is also

TOP AND BOTTOM

a great effort-saver as the operator simply slides the block on rollers into the turnover fixture, where it is automatically rotated 90 degrees and delivered to the clamping fixture in the working position. Discharge is also automatic, by a reversal of the loading process. *Greenlee Automatic Production Machines are designed to save time, effort, and money.*

PRODUCTION MACHINERY

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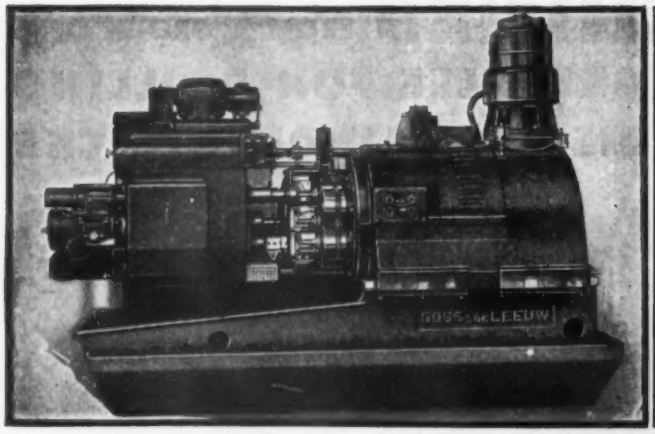

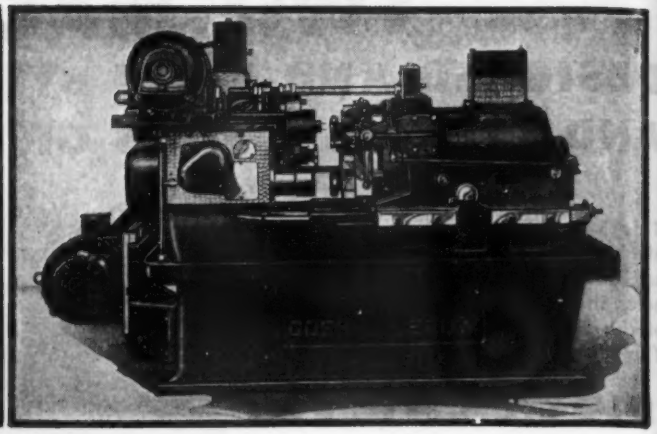

WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

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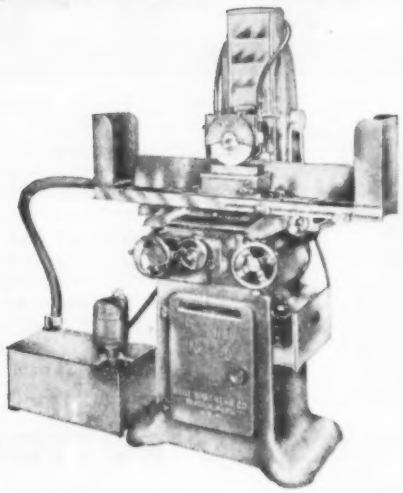

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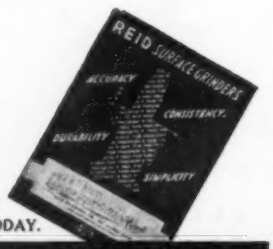

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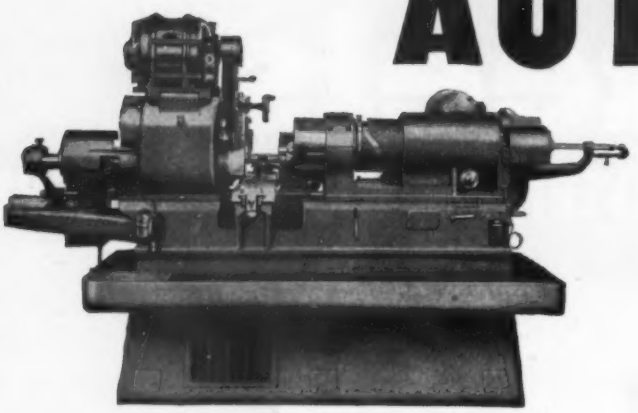

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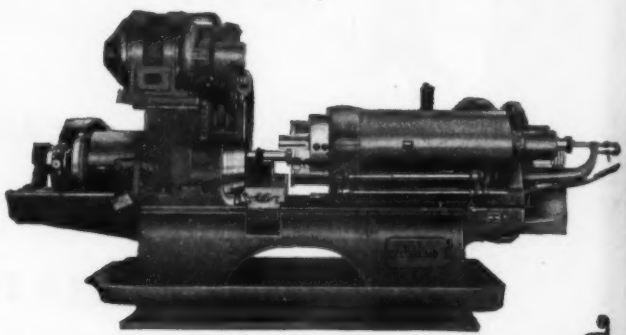
and other standard models cut costs on turning and forming bar and tube stock from 9/16" to 10" OD

CLEVELAND MODEL B2½"—18"



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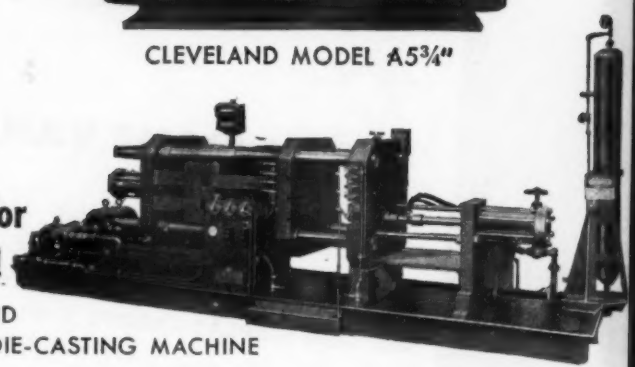

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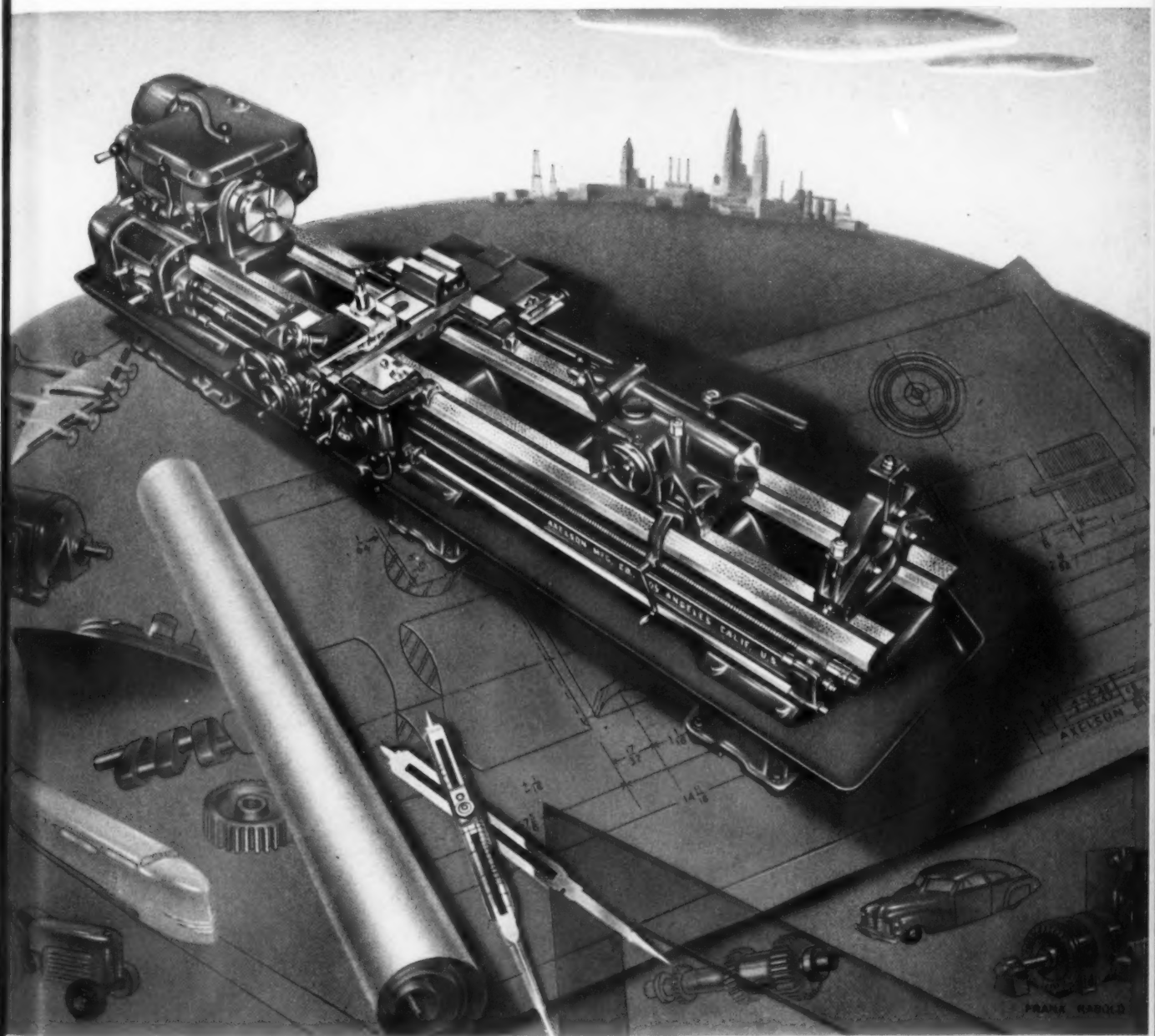

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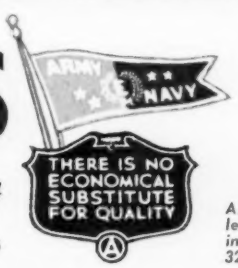

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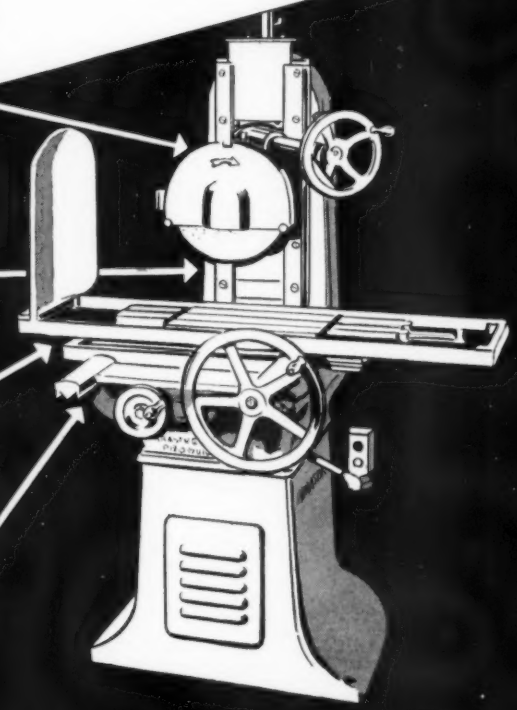

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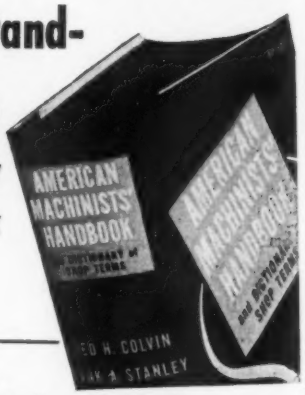

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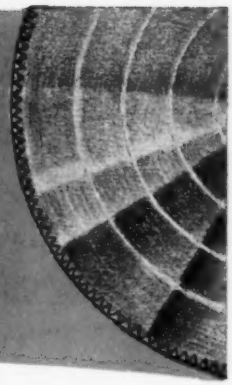

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1 **EASIER OPERATION** Sliding ram gives clear view of work.

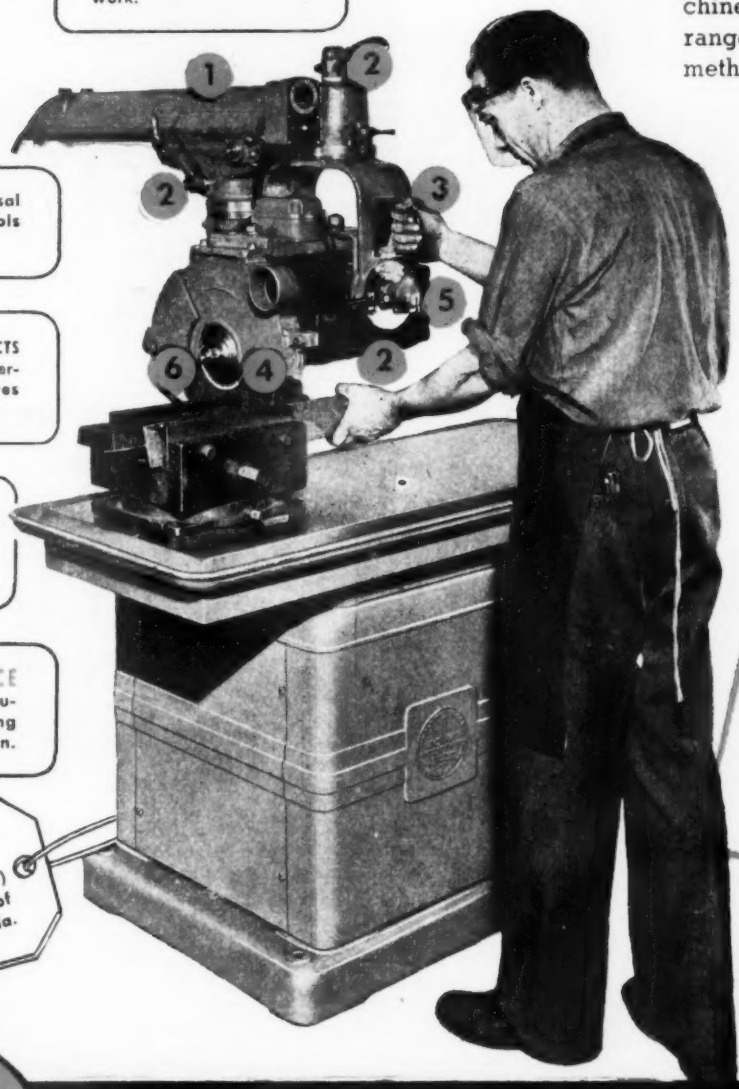
2 **QUICK SETTING** Universal head, convenient controls easily adjusted.

3 **ELIMINATE COSTLY REJECTS AND LOST TIME** "Finger-touch" control improves quality of work.

4 **FASTER CUTTING** Due to smaller blades with greater rim force.

LOW MAINTENANCE Sturdy construction, accurately machined moving parts, easy lubrication.

LOW PRICE $374.50 (with 2 or 3 H.P. motor) Slightly higher west of Rockies and in Canada.



5 **LOW POWER CONSUMPTION** Patented geared design permits use of 2-3 H.P. Motors.

6 **LOWER BLADE COSTS** "Slab-cutting" method gives more effective cutting with smaller blades.

WRITE FOR NEW FOLDER

WALKER-TURNER COMPANY, INC.
PLAINFIELD, N. J.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

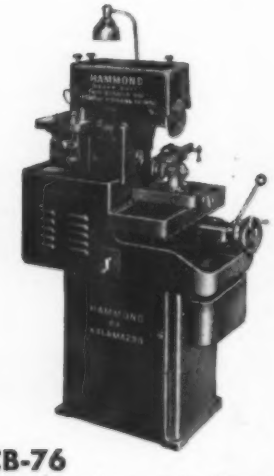
10" Wet or Dry CARBIDE GRINDER

"You're dry when you grind wet" — due to No Splash — No Spray, patented, wheel guards.

Hammond of KALAMAZOO

CARBIDE TOOL GRINDERS

MOST COMPLETE LINE FOR EITHER WET or DRY OPERATION



CB-76
Chip breaker and diamond finishing grinder for fast, smooth, accurate, vibrationless operation. Accomodates 7" cup wheel on left side, 6" diamond wheel on right side.

6"
Heavy construction — 6" cup wheel grinder is ideal for rough and finishing all small carbide tools and for diamond finishing on large size tools.

POPULAR NO DUST GRINDER

10", 12", 14" —
No-Dust grinders with built-in dust collector . . . save space! Can be used for general tool grinding and grinding steel shanks on carbide tools.

HAMMOND PRODUCTS — Carbide, General Purpose and Abrasive Belt Grinders • Automatic and Cylindrical Finishers • Polishing Lathes

Hammond Machinery Builders INC.

1618 DOUGLAS AVE. KALAMAZOO 54, MICHIGAN • EASTERN BRANCH: 71 WEST 23rd ST., NEW YORK 10, N. Y.

Now you can have

MILLING ACCURACY *with* TAPPING SPEED

with the new

PLAN-O-MILL NUMBER 1

Right: Cutaway view of part shows Plan-O-Mill performing a typical internal threading operation with the cutter engaged in the thread. *Below:* Plan-O-Mill Number 1 set-up for an internal threading operation.

You get both milling accuracy and tapping speed in the new Plan-O-Mill Number 1.

MILLING ACCURACY because the part does not revolve, and because of Plan-O-Mill's exclusive electronic feed control. TAPPING SPEED because this machine mills a complete thread—internal or external—in one revolution, provides a complete part in as little as 8 seconds! Blind holes are no obstacle. Set-up is simple. Operation is at the push of a button.

Plan-O-Mill Number 1 provides all these production advantages—*plus* cylindrical form milling—in a compact space-saving size requiring less than 9 square feet of floor! Let Plan-O-Mill help *you* lower unit costs by saving time, materials, tools, space and manpower. Write today for data sheet and floor plan, or contact your machinery dealer.

5 FIRSTS BY PLAN-O-MILL

- **First to install General Electric's remarkable new Thy-mo-trol electronic feed control!**
- **First planetary to mill external threads with standard multiple thread cutter!**
- **First planetary to coordinate feeds and speeds!**
- **First to provide absolute control of feed-in!**
- **First to offer a practical, low cost carbide thread milling cutter!**

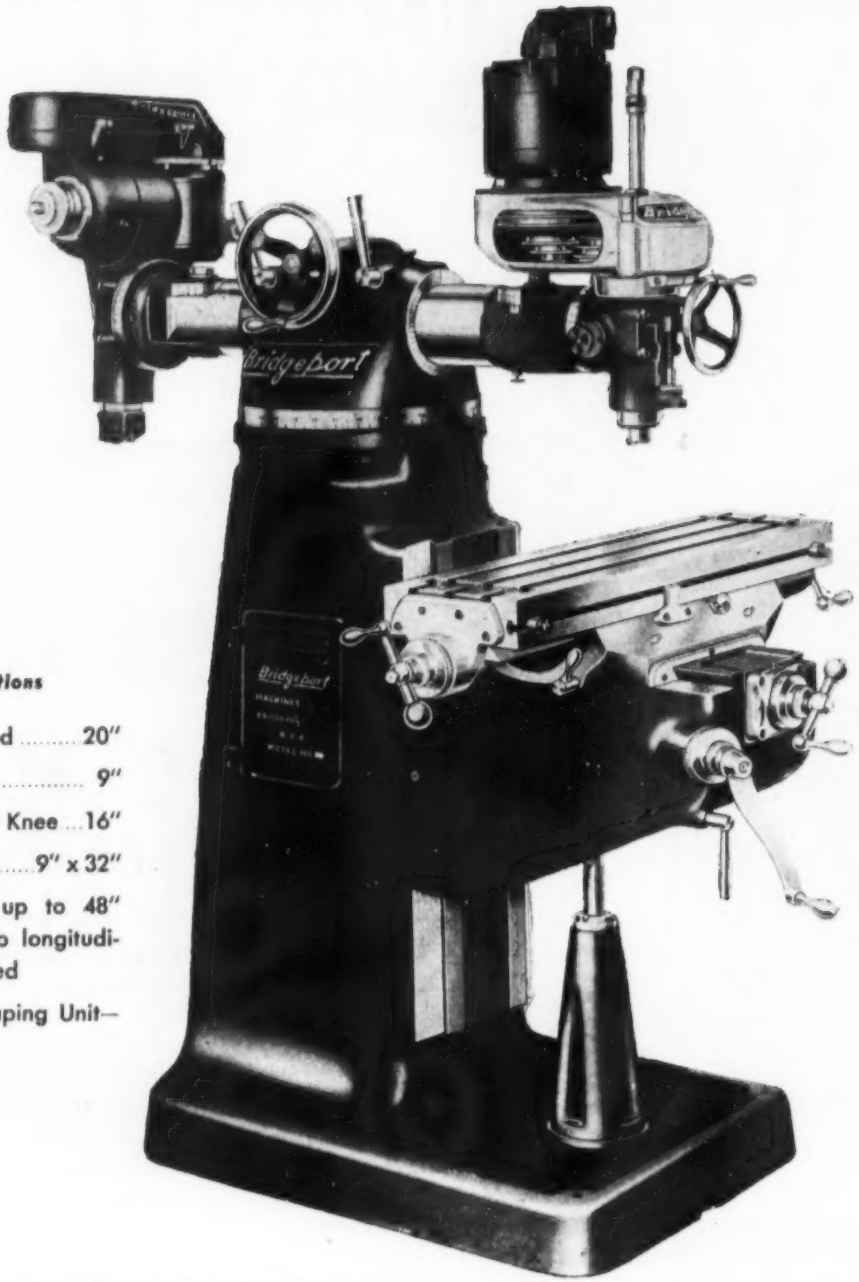
PLAN-O-MILL CORPORATION
1511 E. EIGHT MILE ROAD
HAZEL PARK, MICH.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

THREAD AND FORM PLAN-ED MILLING CUTTERS

Bridgeport

TURRET MILLING MACHINE



Specifications

Longitudinal Feed ..... 20"

Cross Feed ..... 9"

Vertical Feed of Knee ... 16"

Standard Table ..... 9" x 32"

Special Tables up to 48" available; also longitudinal power feed

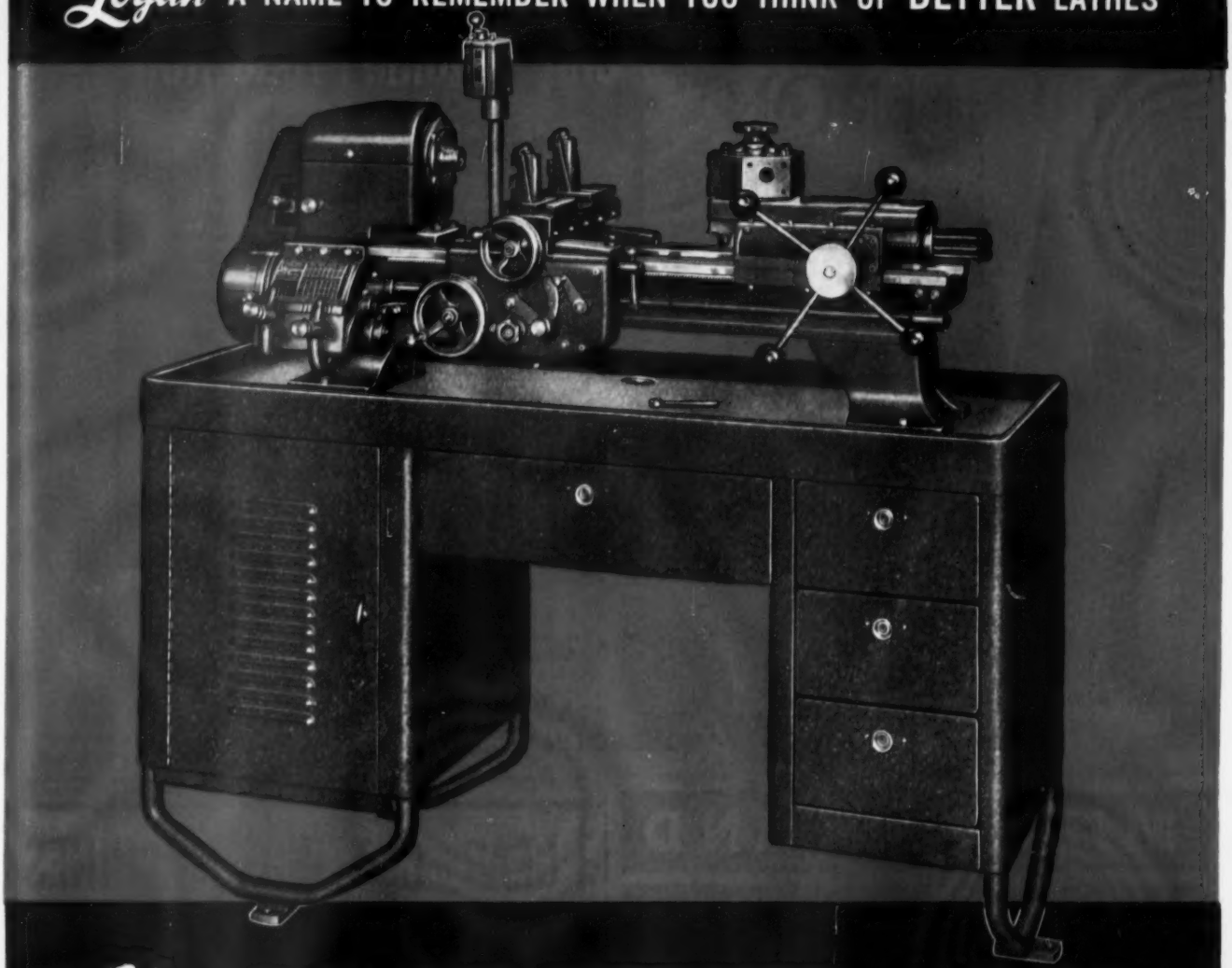
Weight with Shaping Unit—2000 lbs.

In the "Bridgeport" are offered a wide range of operations *in a single machine*, an advantage which means definite savings in investment cost. Ability to mill, drill and shape at all angles without change in work set up makes the "Bridgeport" invaluable in shops with limited budgets for new equipment or where space limitations make it impractical for the installation of several individual machines which would otherwise be required to do the same work.

It will pay you to investigate, regardless of the size of your pocketbook or the floor space available.

The Bridgeport MACHINES, Inc.
Bridgeport, Conn.

Logan A NAME TO REMEMBER WHEN YOU THINK OF BETTER LATHES



New LOGAN TURRET LATHE

Precision Built For Sustained Accuracy, Speed, Versatility and Convenience

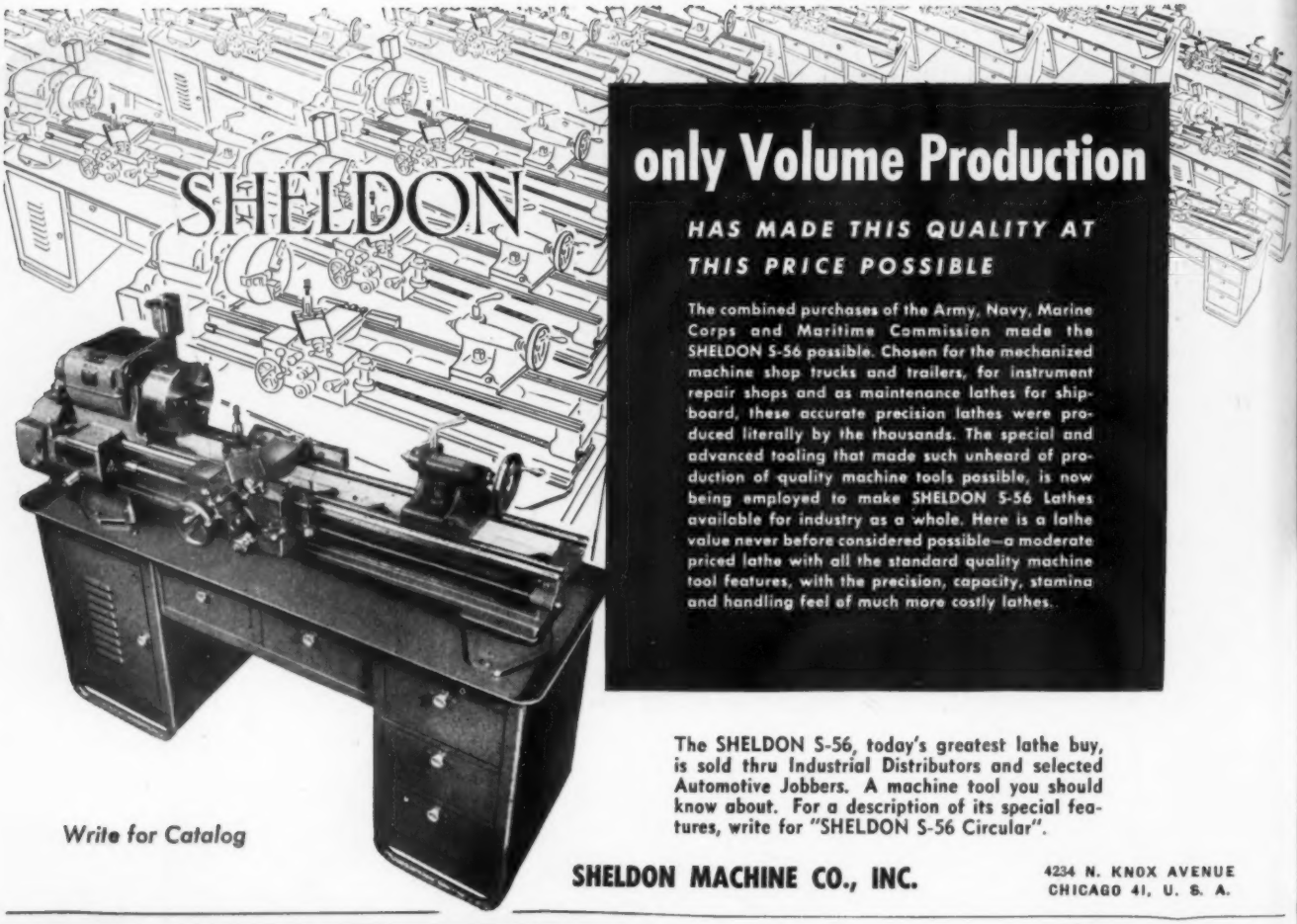
LIKE all Logan Turret Lathes, the new No. 845-2 turns out a volume and variety of accurate work at high speed and low cost. In addition, it is mounted on a compact, all steel, 4-drawer cabinet that provides convenient tool storage. Note the three-point base on which this cabinet stands, an exclusive Logan feature that gives firm footing on any floor.

The new No. 845-2 has all the Logan advanced design features that assure accurate work, versatility, and low cost maintenance through the years. The spindle turns on ball bearings. Self-lubricating bronze bearings are at 40 other vital points. The friction feed automatic apron travels on bed ways which are precision ground to within .0005" of parallelism. The heavy, pilot operated, hexagonal turret provides smoothness and accuracy on heavy cuts, and lengthens tool life as well. The underneath motor drive is completely enclosed in the left side of the steel cabinet. A standard Logan compound rest assembly and tailstock assembly are practical accessories to order with the lathe. They are interchangeable with the cross slide and turret, quickly converting the No. 845-2 into a screw cutting lathe.

SPECIFICATIONS COMMON TO ALL LOGAN LATHES . . . Swing over bed, 10½" . . . bed length, 43⅛" . . . size of hole through spindle, 25/32" . . . spindle nose diameter and threads, per inch, 1½"-8 . . . twelve spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways, 2 flat ways.

H-1

LOGAN ENGINEERING CO. CHICAGO 30, ILLINOIS



SHELDON

only Volume Production

HAS MADE THIS QUALITY AT THIS PRICE POSSIBLE

The combined purchases of the Army, Navy, Marine Corps and Maritime Commission made the SHELDON S-56 possible. Chosen for the mechanized machine shop trucks and trailers, for instrument repair shops and as maintenance lathes for shipboard, these accurate precision lathes were produced literally by the thousands. The special and advanced tooling that made such unheard of production of quality machine tools possible, is now being employed to make SHELDON S-56 Lathes available for industry as a whole. Here is a lathe value never before considered possible—a moderate priced lathe with all the standard quality machine tool features, with the precision, capacity, stamina and handling feel of much more costly lathes.

Write for Catalog

The SHELDON S-56, today's greatest lathe buy, is sold thru Industrial Distributors and selected Automotive Jobbers. A machine tool you should know about. For a description of its special features, write for "SHELDON S-56 Circular".

SHELDON MACHINE CO., INC.

4234 N. KNOX AVENUE
CHICAGO 41, U. S. A.

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

½ to 20 HORSEPOWER DRIVE

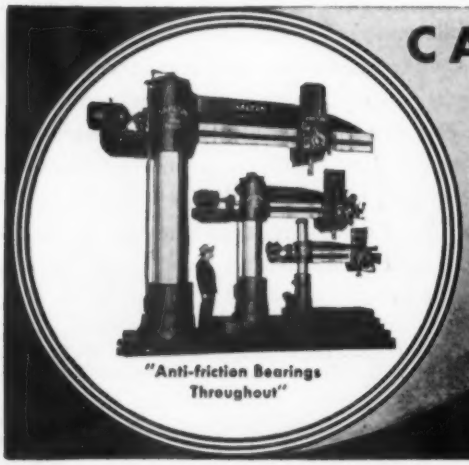
AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

GEAR CUTTING MACHINES

New Design
New Features
New Advantages

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

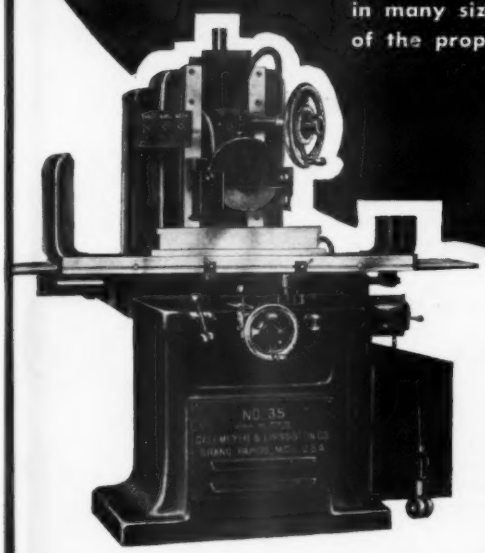
FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

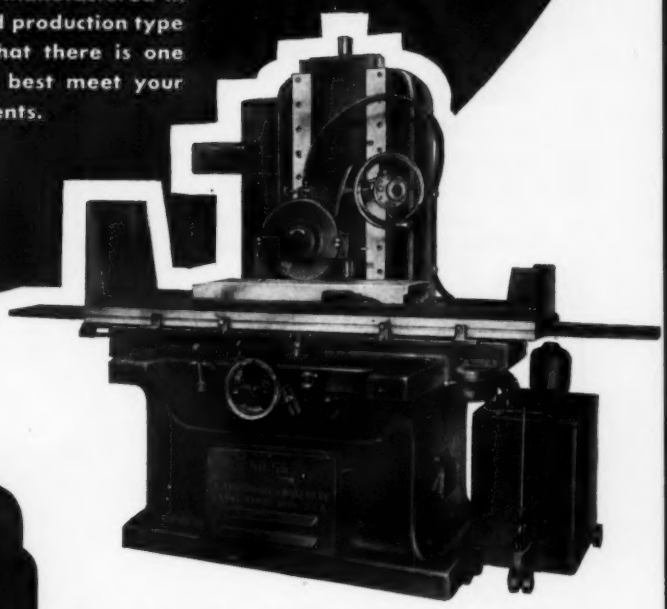
ARMY E NAVY

GRAND RAPIDS
HYDRAULIC FEED SURFACE
Grinders

GALLMEYER & LIVINGSTON COMPANY is today building what is without question the finest, smoothest, and fastest Hydraulic Feed Surface Grinders of their entire career — a direct result of over 35 years of experience in the design and production of high grade precision grinding machinery. These machines are manufactured in both precision tool room type and production type in many sizes with the result that there is one of the proper size and type to best meet your particular requirements.



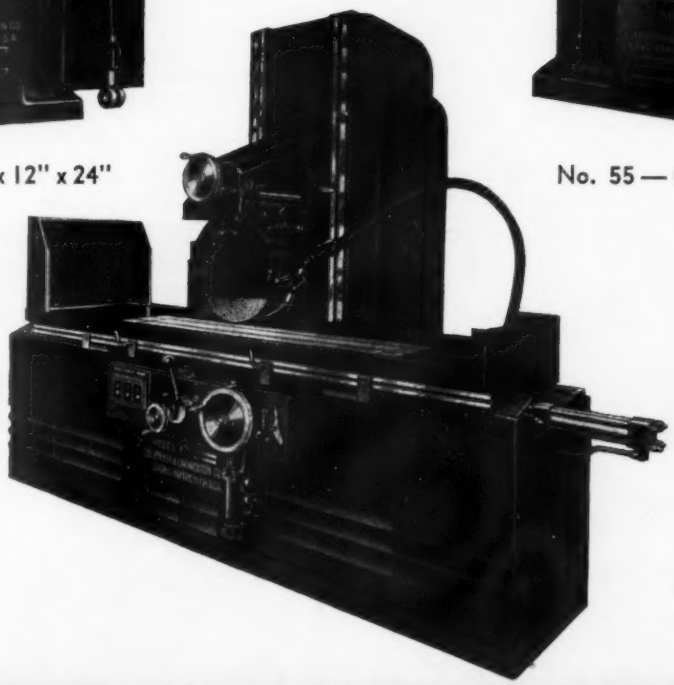
No. 35 — Capacity 8" x 12" x 24"



No. 55 — Capacity 12" x 17" x 36"

Precision Tool Room Type Machines

This is the type of GRAND RAPIDS Hydraulic Feed Surface Grinder on which one prominent machine tool builder obtains a 5 micro inch finish operating machine at 125 feet per minute. They are illustrated and described in bulletin GL-100.



Production Machines

GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders manufactured by the GALLMEYER & LIVINGSTON COMPANY are designated as Model F and Model A and feature the use of wide faced wheel and cross traveling head. GRAND RAPIDS Production Type Hydraulic Feed Surface Grinders are illustrated and described in bulletin GL-4-1-43. Write for your copy today.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE. S.W.

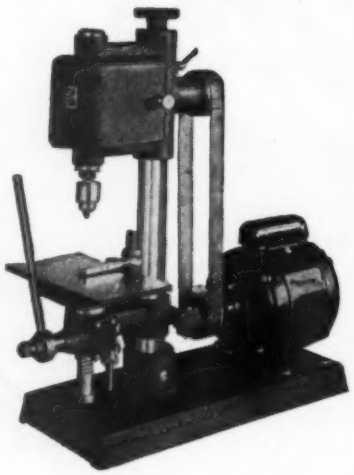
GRAND RAPIDS, MICHIGAN

When Minimum Fractional Precision Is Imperative

HAMILTON MACHINES

for better seeing · better feeling · better drilling

HAMILTON SENSITIVE TAPPER



More units per hour. For tapping operations on instrument, camera, watch, clock, business machines and all other precision work. Smooth, easy operation *without breakage of even the smallest taps.*

Fool-proof; noiseless; head mechanism is completely hooded so operator is protected from oil and dirt.

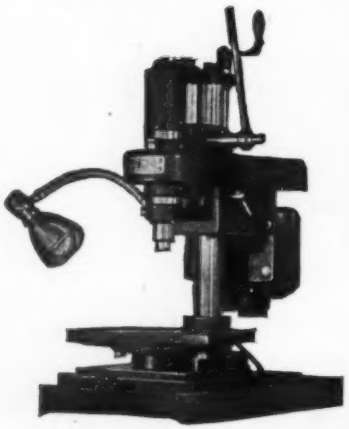
For any threadable material. From smallest and finest thread, up to and including 10-32.

• • •

HAMILTON "VARIMATIC"

Super-Sensitive Drilling Machine

for small holes .004" to 5/16" dia.



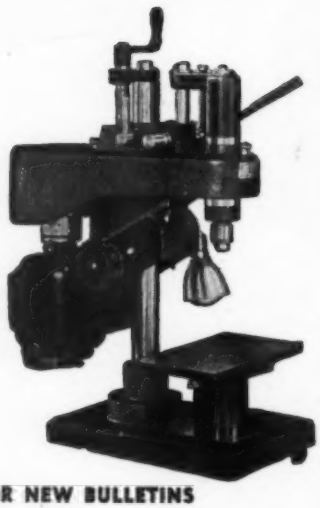
Two speed ranges, infinitely variable. Built with "instrument precision" for finest drilling in tool rooms, Diesel, instrument, electrical, aircraft and other uses. Bold in design, sturdy, convenient, perfectly constructed. Self-contained drilling unit swings radially on column and locks to any position. From 840 to 9300 r.p.m.

• • •

HAMILTON "MAXI-JR-E"

Super-Sensitive Drilling Machine

for small holes .004" to .250" diameter



May be used singly or in gangs. Possible spindle speeds from 750 to 12,000 r.p.m. Full floating spindle designed to eliminate radial belt pull on the spindle. Within its capacity the extreme flexibility of MAXI-JR-E meets all requirements conveniently and economically.

WRITE FOR NEW BULLETINS

THE
HAMILTON TOOL CO.
HAMILTON, OHIO

The "PRODUCTION" Type S

CENTERLESS GRINDER

Handles cylindrical or flat and irregular work at high speed

This machine is a combination of a vertical centerless feed polisher with a horizontal grinder, surfacer, polisher or buffer. Change from vertical to horizontal position can be made quickly and easily.

Regardless of the kind of work handled, the Type S Machine will give a fine uniform finish on any material at high speed even in the hands of unskilled operators.

SPECIFICATIONS

Capacity centerless feed . . .¼" to 1" diam.
Belt Speed . . . 3200' per min.
Table to floor . . . 38"
Motor . . . 1 H.P.
Furnished with or without Feed or Base
Available in Pedestal or Bench types.

Illustrated Literature will be sent promptly on request. Write today.

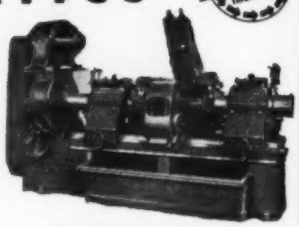
PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

Horizontal ROTO-MATICS

When high production is in demand on your machining problems your requirements can be met with a Horizontal Roto-Matic. Continuous, non-indexing operation together with roughing and finishing spindles insure maximum output. ***Bulletins 110 and 120*** are available for suggested solutions to your problems.



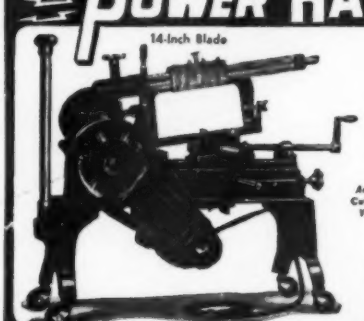
No. 1-A Continuous Rotary Drum Type Miller

Davis and Thompson Co.

Mfrs. of Machine Tools and Micrometers

6411 W. Burnham St. Milwaukee 14, Wisconsin

POWER HACK SAW ★



LOW PRICED* SELF-CONTAINED

PORTABLE STURDY

READY TO WORK

ECONOMICAL

EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.

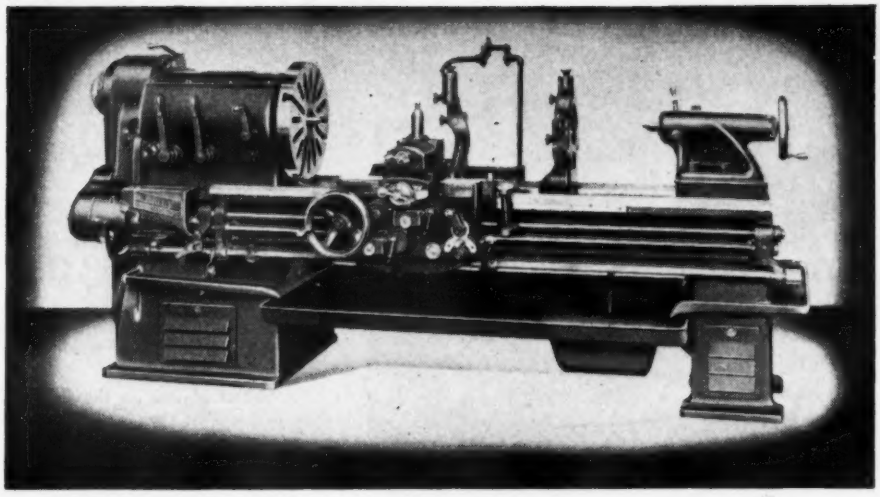
WRITE FOR BULLETIN NO. 400

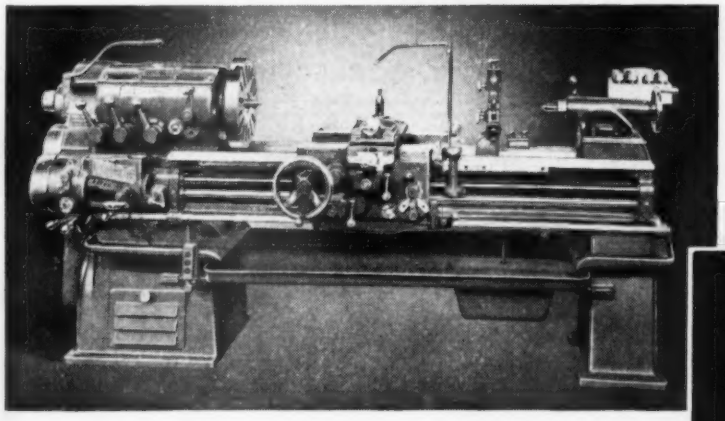
MILLER-KNUTH MFG. CO. OMAHA, NEB.

LATHES ...for PROMPT DELIVERY!

(Approximately 2 to 4 weeks shipment. We have available standard motors in 220/440 volt, 3 phase, 60 cycle)

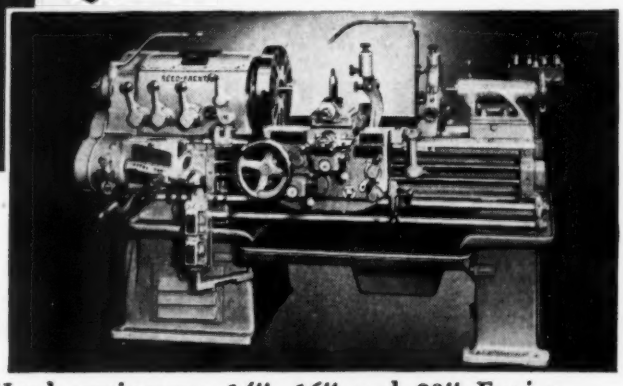
Reed-Prentice Sliding Gear Head 20" Engine Lathe has many features, resulting in precision, economy and operating efficiency. Rugged construction, modern design, unexcelled workmanship and finish — all contribute to its reputation for machine tool supremacy.





Reed-Prentice Sliding Gear Head 16" Lathe — available in Engine and Toolroom models.

Reed-Prentice Sliding Gear Head 14" Lathe — available in Engine and Toolroom models.



REPLACE WORN EQUIPMENT . . .

How much of your lathe equipment is old in service — beyond its years? Now is the time to retire overworked, war-worn engine and toolroom lathes and replace with new, efficient REED-PRENTICE Sliding Gear Head equipment. 14", 16" and 20" Engine and 14" and 16" Toolroom Lathes available with standard equipment and accessories described in our circulars — write for them without delay!

★ ★ ★ ★ ★

MACHINE TOOLS

REED-PRENTICE CORP.

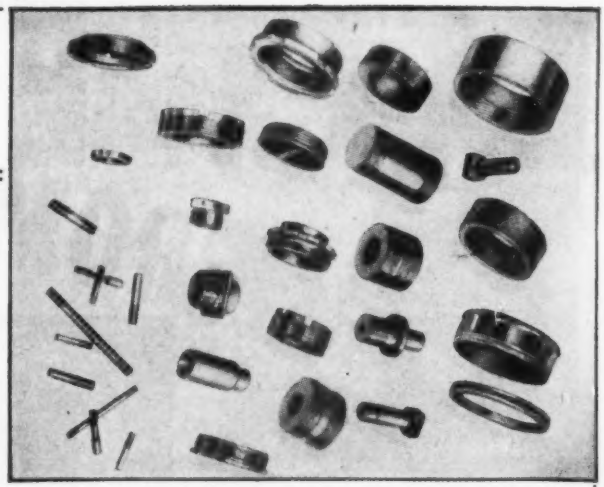
WORCESTER MASS., U.S.A.

★ ★ ★ ★ ★ ★ ★ ★ ★

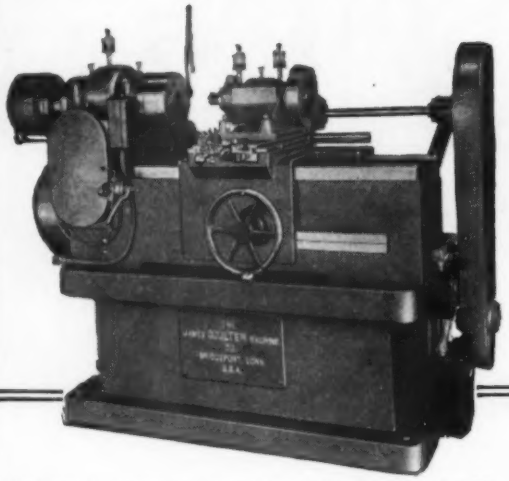
NEW YORK OFFICE: 75 West St., New York 6, N. Y.

CLEVELAND OFFICE: 1213 W. 3rd St., Cleveland 13, Ohio

. . . for Precision Internal or External Threads . . . Right or Left Hand



HANDLE PRODUCTION AUTOMATICALLY on the COULTER HOB THREAD MILLER



This modern machine can be depended on to produce and duplicate close tolerance threaded parts. With the exception of loading, all operations are fully automatic. Any parts that can be held in a Universal chuck, air-operated chuck or special fixture can be threaded, on the COULTER, internally or externally, either right or left hand.

Work can be inserted from either face or rear end, through large hole in work spindle, thereby making possible the threading of shaft ends, tubing or other long work.

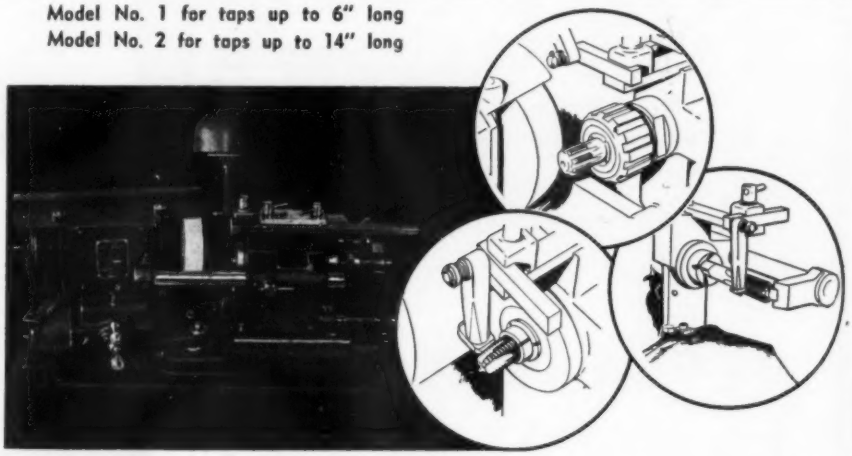
Individual Motors on the COULTER for work and cutter spindles provide a wide range of speeds and feeds for handling such materials as brass, aluminum or steel.

Illustrated literature covering full details of this machine is available promptly on request.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT, CONNECTICUT

"For lands sake" KEEP TAPS SHARP ON A BLAKE TAP GRINDER

Model No. 1 for taps up to 6" long
Model No. 2 for taps up to 14" long



When you purchase taps, you expect and get specified tolerances on every part. But, when these taps must be resharpened, do you repeat this *original* accuracy every time? When you sharpen the chamfer on a Blake Tap Grinder, you can be sure of maintaining *original* accuracy throughout the life of every tap. This means an increase in accurately tapped holes, and a decrease in broken taps and scrapped work.

For lands sake, sharpen taps (either left- or right-hand) with 2, 3, 4, 5, 6, 8, and 10 flutes on a Blake Tap Grinder. The Blake is also ideal for sharpening countersinks and other tools requiring relief at the point.

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

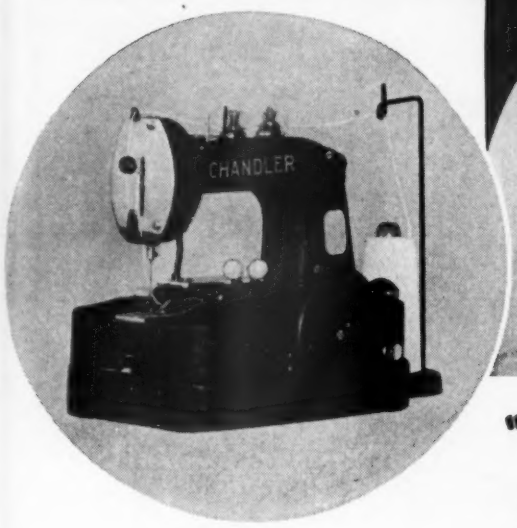
BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 544 which describes the Blake Tap Grinder in detail.
A.M.

Name..... Title.....
Company.....
Street.....
City..... State.....

Right: Bench model Sunnen Precision Hone in use at Chandler Machine Company.

Below: The efficient, smooth operating Chandler Button-Sewer.



"WE GET SMOOTHER—TRUE HOLES FIVE TIMES AS FAST—

With the Sunnen Precision Honing Machine"

—CHANDLER MACHINE CO.

Hardened steel parts, bearings, connecting links, and other parts going into their sewing machines have been honed for several years at the Chandler Machine Company of Ayer, Mass.

Tolerance is held within .00025" with a very smooth mirror finish on the honed surface. Previous to using Sunnen honing, these parts were lapped — and copper laps were constantly wearing out, leaving bell-shaped holes. In addition to spoiling materials, lapping was costing them a great amount of unnecessary production time.

Now, the Sunnen Precision Honing Machine is giving them smoother finishes in more accurate holes — *at least* five times as fast.

If you have an internal finishing problem on which you need greater accuracy — or more speed — or a smoother finish, ask a Sunnen engineer to call, or write for a free bulletin giving complete details of Sunnen Honing.

The Sunnen Precision Honing Machine —

1. Hones and finishes internal cylindrical surfaces from .185" to 2.625".
2. Accuracy is guaranteed within .0001".
3. Produces super-smooth finish.
4. Used in ferrous or non-ferrous metals, plastics, ceramics, glass, etc.
5. Accurately duplicates sizes.
6. Does not require skilled labor.
7. Can be "set up" for any size in 1 minute.
8. No jigs or fixtures needed.
9. Economical to operate.

SUNNEN

SUNNEN PRODUCTS COMPANY

7941 Manchester Ave., St. Louis 17, Mo.

Canadian Factory: Chatham, Ontario

Typical Jobs

Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Inner Bearing Ring "Accurately removes last 'tenth' of stock."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* **APPROVES!**

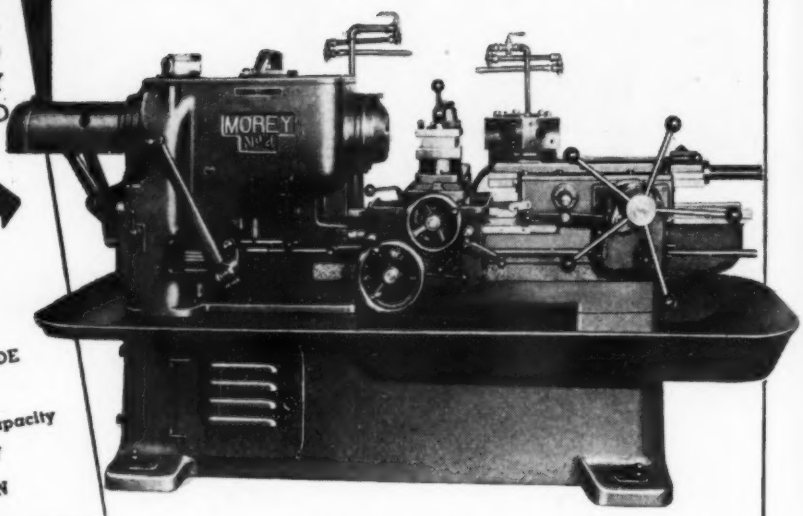
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12" turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor. 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal. 1½" capacity
No. 2 Plain. 1" capacity

ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

Save Time . . . Cut Costs

Remarkably fast cutting of Metals
is assured by

PORTER-McLEOD
COLD METAL SAWING MACHINE

Cutting of metal stock is put on a really high production basis by this powerful, conveniently handled, clean, fast and accurately cutting Porter-McLeod machine. It can be depended on to save time on the wide range of stock cutting involved in peacetime work.

In addition to its capacity for handling up to 8" round or 7½" square stock, this machine is provided with a unique method of holding work which enables it to nest economical quantities of bars and shapes for multiple cutting. All cutting is fast because a 3" per minute feed is provided.

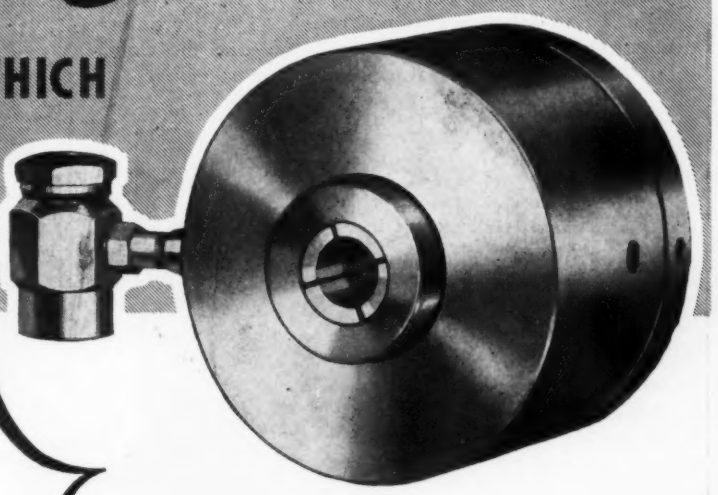
Fast, accurate work and long blade wear are made possible by an upward feeding of specially designed and supported blade and by a friction disc feed.

Outline your cutting-off problem and ask for our recommendations to solve it. Send at once for Descriptive Bulletin on the 8" Porter-McLeod cold metal sawing machine.

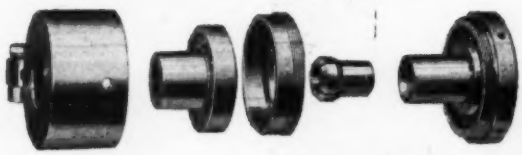
PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U. S. A.

New AN AIR OPERATED SPEED CHUCK WHICH

- provides guaranteed accuracy
- speeds chucking
- decreases operator fatigue
- is simple to operate
- requires practically no maintenance

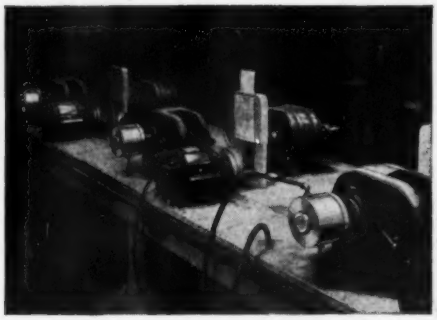


Now being introduced to industry, this Erickson Speed Chuck at last delivers all the guaranteed accuracy and gripping power of other Erickson precision collet chucks, and in addition, fool-proof Air Operation, either by hand or foot-valve. Quick-change production is facilitated, and operator fatigue, as a result, decreased to a marked degree. It has been proven very efficient over an extended period of continuous operation, and requires very little maintenance. Range: Model 4AT—⅛" to 1", available now; Model 6AT—1" to 2", to be released soon. These models are adaptable to any spindle. Send the coupon at once for full information at no obligation. Do it today.



Above you see an exploded view of the Air Operated Speed Chuck which shows its simplicity of construction. This means lower maintenance costs for you because there is practically nothing that can go wrong with it.

STUPAKOFF CERAMIC RECOMMENDS IT AS *"A Distinct Improvement"*



At left is shown an operator in the Stupakoff plant performing a polishing operation and in the other illustration, a battery of speed chucks ready for service. We quote excerpts from a Stupakoff report on performance, "increased production considerably . . . speeded up chucking operation and decreased operator fatigue. We can readily recommend it as a distinct improvement over ordinary chucking devices."

Erickson

makes

precision collet chucks

Dept. D. of Erickson Tools
2306 Hamilton Ave., Cleveland, Ohio

Please send at once Circular D and complete information at no charge on your new Air Chuck and how it can benefit me.

NAME.....

ADDRESS.....

CITY.....STATE.....

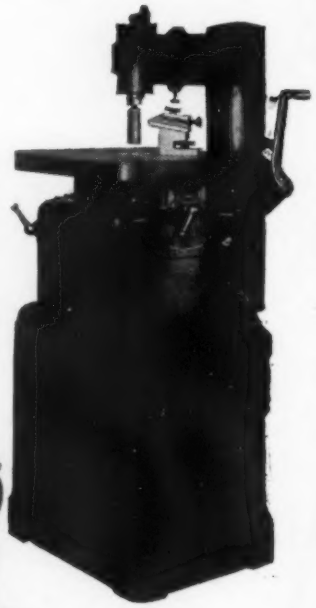
Precision Grinding

IN THE TOOL ROOM .... IN PRODUCTION

Designed for the tool room and die shop where precision workmanship is all important . . . built with Boyar-Schultz quality, resulting in sturdiness that HOLDS accuracy, not only in tool and die work, but in production wherever accuracy is necessary.

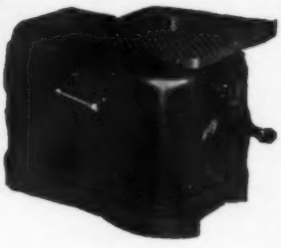
No. 2
PROFILE GRINDER

A large, floor model Profile Grinder with two independently powered spindles operating at 10,000 R. P. M. with vertical oscillations. Available also with single (lower) spindle only.



No. 618
SURFACE GRINDER

A sturdy, easy operating Surface Grinder, designed for the tool room and built to give positive precision performance. Table is equipped with hardened and ground steel ways for long time accuracy.



No. 1
PROFILE GRINDER

A bench size Profile Grinder, a time saver in grinding dies, punches, cams and templates. It is a rapid stock remover and operates at 20,000 R. P. M.

WRITE FOR NEW CIRCULARS DESCRIBING THEM

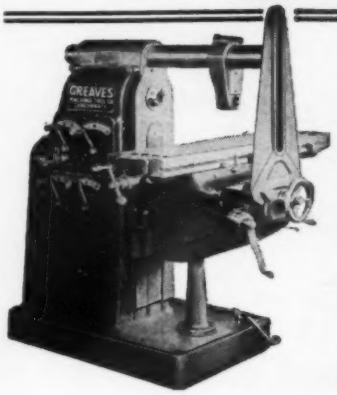
BOYAR-SCHULTZ CORP.

2109 Walnut Street **CHICAGO 12, ILL.**

GREAVES No. 2

PLAIN or UNIVERSAL MILLING MACHINE

. . . for Speed, Accuracy, Production and Tool Room Work . . .



featuring:

Power Feeds, all Directions
Rapid Traverse—6-way
Alloy Hardened Gears
One Shot Lubrication to Table, Saddle Slides and Screws
All Speed and Feed Changes through Positive Gearing
All Speed and Feed Gearing run in Oil
Timken Bearings
Glass Sight Oil Control
Unit Construction
Central Control Position for all Operation Levers
Coolant System

Specifications

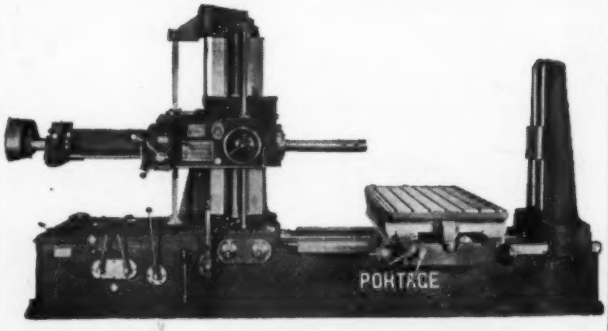
Table—52¼"x12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse—Longitudinal—cross and vertical—All directions—75" per minute
Weight—3750 lbs.

Send for illustrated literature giving complete information.
Write for nearest agent or dealer

Exclusive Distributors

H. LEACH MACHINERY CO.
387 CHARLES STREET **PROVIDENCE, R. I.**

PORTAGE



NO. 4 HORIZONTAL BORING DRILLING & MILLING MACHINE

• A ruggedly built machine capable of operation at maximum speeds and feeds to produce accurately finished work. . . . Machine furnished with coolant type table with either 36" x 60" working surface and 48" cross travel, or 48" x 72" working surface and 60" cross travel. . . . Extra height columns increase working capacity. . . . For greater speed—precision—high production specify PORTAGE.

WRITE for full descriptive bulletin today.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

PLAY THE ACE TO WIN!

OLIVER OF ADRIAN

PRODUCTS

GRINDS DIFFICULT CUTTERS EASILY

The ACE reverses ordinary cutter grinding practice in that the work is held stationary while the grinding wheel traverses the edge of the cutter. The grinding wheel has a stroke of 10" and is traversed by rack and gfiear actuated by lever adjustable to position of operator.

The ACE is simple, highly accurate, and physically easy to work with. It saves setting-up time, only two fixtures are required to grind all types of cutters. Direct reading for clearance eliminates minutes—eventually hours—of computation. New in principle, the ACE is already old in experience in hundreds of plants.

We recommend it for grinding face mills up to 15" . . . slitting saws . . . mill ends . . . angular cutters . . . slab mills . . . dove tail cutters . . . reamers . . . taper reamers . . . gear cutters . . . double angle cutters. Fellows helical cutters . . . production gashing . . . radial relief grinding . . . and newer uses found every day.

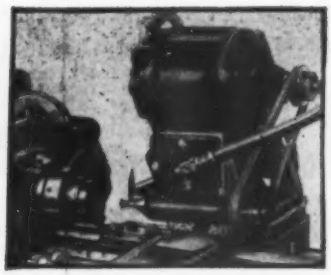
OLIVER INSTRUMENT CO.

1414 E. MAUMEE ST. ADRIAN, MICH.

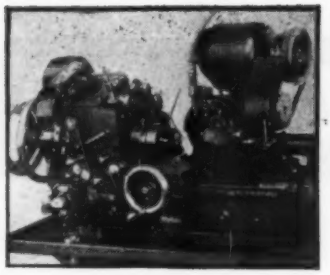
Don't Neglect Your Toolroom It's the Backbone of Production!

Oliver OF ADRIAN

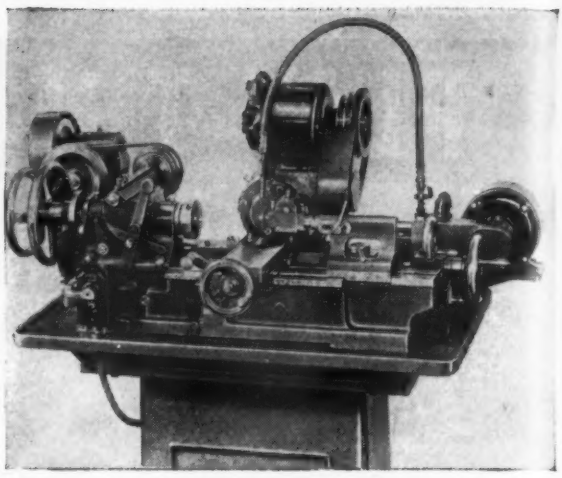
AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

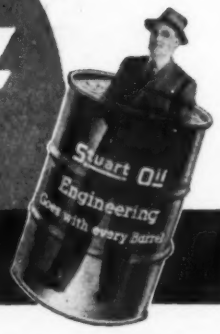
WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

. . . when you must use a soluble oil—and the job is tough

Solvol has extra lubricating qualities which enable it to perform metal cutting jobs beyond the scope of other soluble products. This unique product, plus the skill of Stuart Oil Engineers, can solve machining problems for you. D. A. Stuart Oil Co. Ltd., 2729 So. Troy Street, Chicago 23, Illinois.

Stuart's
SOLVOL
(Aquamix)
LIQUID CUTTING COMPOUND



D.A. Stuart Oil co.

FOR ALL CUTTING FLUID PROBLEMS
Stocks in Principal Metal Working Centers

ESTABLISHED 1865

IF YOU WANT DRILLING MACHINES••

Accurate... Well built... Good Delivery

CHECK ✓

1. **R.F.C.** For that machinery which will give you good productivity.
2. **SIBLEY** For efficient drilling to meet modern production demands.

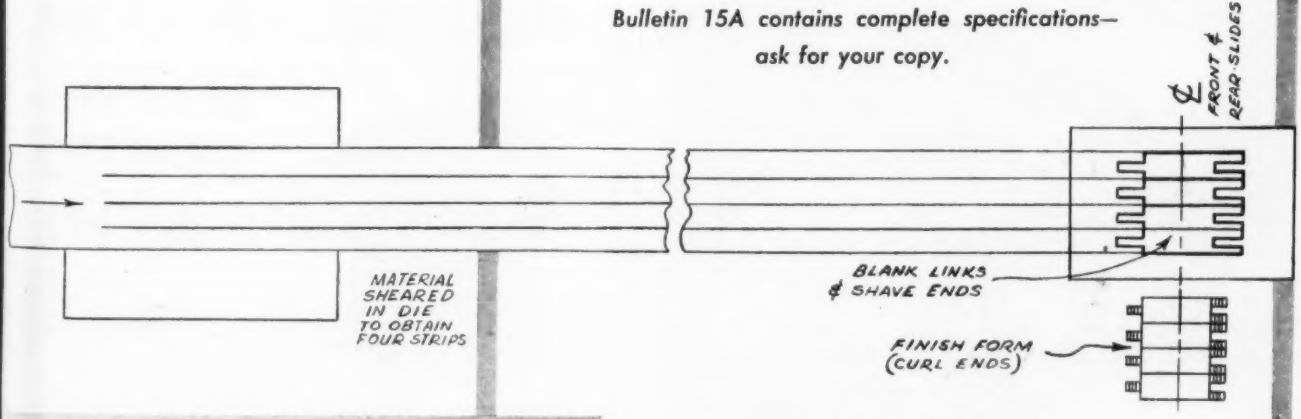
SIBLEY

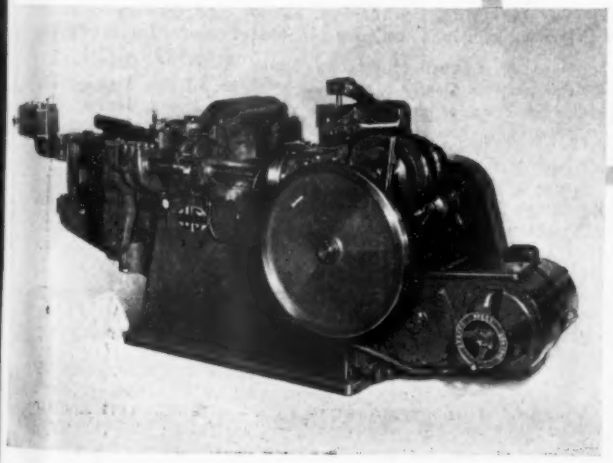
MACHINE & FOUNDRY CORP. *South Bend 23, Ind.*

The No. 33 U. S. MULTI SLIDE *setup to produce with minimum waste of stock*

THE refrigerator part illustrated above is being produced at one of the General Electric Company plants using the No. 33 Multi Slide Machine. The line drawing indicates the sequence of operations followed in the fabrication of the part. Material is aluminum; it will be observed that four links are produced at each stroke of the machine which, for the work, runs at a speed of 85 strokes per minute—resulting in the production rate of 340 completely formed links per minute. In addition to the high rate of production obtained on this job, there is a very appreciable savings in material due to the almost complete elimination of scrap. On most jobs, the Multi Slide Machine uses material of the exact width of the part, and so effects comparable savings.

Bulletin 15A contains complete specifications—ask for your copy.





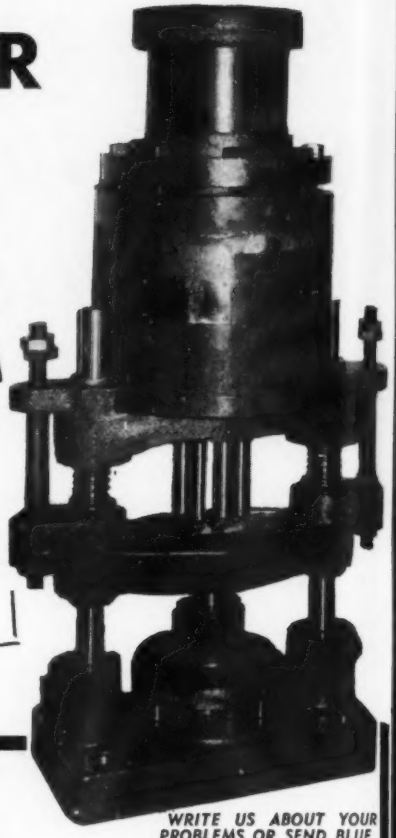
THE NO. 33 U. S. MULTI SLIDE MACHINE USED FOR PRODUCING (FOUR AT A TIME) THE LINK ILLUSTRATED ABOVE.

U. S. TOOL COMPANY, INC.

AMPERE (East Orange), New Jersey

BUILDERS OF U. S. MULTI SLIDES, U. S. MULTI MILLERS, U. S. AUTOMATIC PRESS ROOM EQUIPMENT, U. S. DIE SETS AND ACCESSORIES

Speed Up with BUHR SPECIALIZED TOOL-UPS!



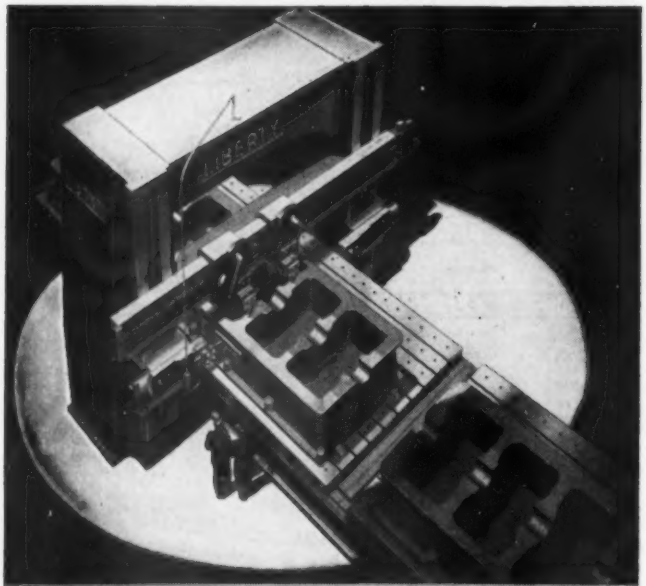
SOLVE YOUR PRODUCTION PROBLEMS THE Buhr WAY!

For complete drilling toolup, and to aid you in solving your reconversion problem of retooling for profitable production we are ready to go with any job you have. Attached to a standard drill press, this toolup job consists of an 8 Spindle Drill Head, Bushing Plate and Fixture for one part, and provides an adapter to fit in the Fixture and hold a mating part. Thus two different parts are drilled from one equipment.

BUHR MACHINE TOOL CO.

GREEN AND DAVIS, ANN ARBOR, MICHIGAN

WRITE US ABOUT YOUR PROBLEMS OR SEND BLUE PRINTS AND WE WILL GIVE YOU THE CORRECT ANSWER.



LIBERTY

SMALL, MEDIUM AND HEAVY DUTY

PLANERS

FOR HIGH SPEED, LOW COST PRODUCTION

LIBERTY PLANERS • HAMILTON, OHIO, U. S. A.

Over a Quarter Century of Specialized Experience with Time Tested Principles of Design

NEW MULTI-PURPOSE IDEAL SPEED LATHE

For Polishing, De-burring, Filing, and General Finishing Operations on Small Metal and Plastic Parts.

Here is a small, light-duty Speed Lathe · Compact · Complete · Ready to Operate · With All the high-quality construction of the famous larger Ideal Speed Lathes, Plus New and Exclusive Time and Labor Saving Features.

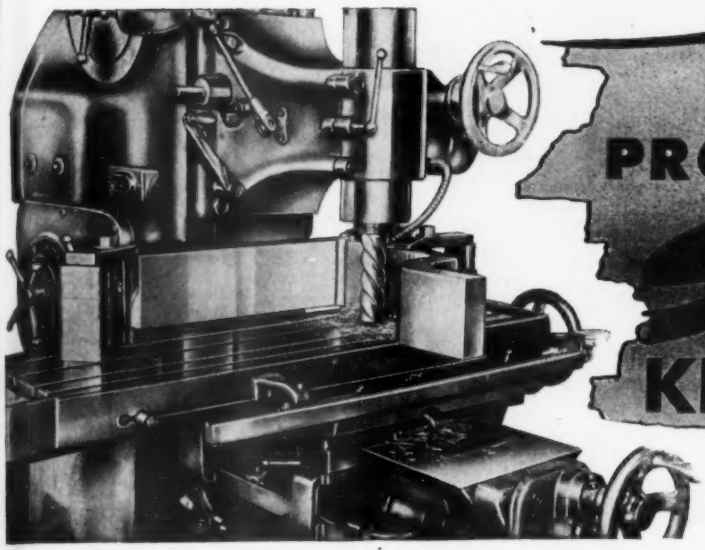
New engineering refinements and improvements provide new ease of operation, greater convenience of operation, and choice of operating sequence through simple, accessible adjustments.

FOR COMPLETE DESCRIPTION WRITE FOR CIRCULAR 453

SCHAUER MACHINE COMPANY

ORIGINATORS OF TODAY'S SPEED LATHES

2067 READING ROAD CINCINNATI 2, OHIO



HERE'S WHY PRODUCTION MEN SELECT KNIGHT-Millers TO CUT COSTS

Multiple dry disc clutch and leather faced brake in main spindle drive gives operator positive control with flexibility to allow "inching" spindle.

Gears of alloy steel, heat treated, finish machined and shaved, mounted on short, ground shafts and ball bearings, provide sixteen spindle speeds in either direction.

Hardened, ground, and lapped spiral-bevel gears, ball bearing mounted, make sure a smooth spindle drive.

Four vertical spindle feeds for boring range from .002" to .010" per revolution.

Positive, quick acting spindle head clamp, controlled by a single lever, securely locks spindle head in any position on accurately fitted slide on face of column.

Single, constant speed motor drives main shaft through multiple V-belts. Compact and accessible. Motor and drive entirely enclosed for safety and cleanliness. Guard easily removed for servicing or adjustment.

A post, accurately ground and rigidly fitted into the column, forms the bearing on which the table unit swivels around the column.

Large trunion on which is assembled the table unit provides for tilting table in either direction. This feature and the one above add to the capacity of the machine.

The knee, actuated by large worm and gear, may be tilted 35° either side of horizontal thereby placing the table in position for angle boring or milling. Four heavy T-slot bolts solidly lock it in any position.

Table and saddle have large bearing surfaces accurately scraped and fitted with adjustable gibs providing a substantial method for locking either in any position. Table has pockets in each end for coolant drain. Both table and saddle have directional feed control levers.

Automatic safety throwout built into feed mechanism provides against overloading and will not allow re-engaging table feeds until overload is removed.

Eccentric bushing in outer table unit support bearings furnishes additional means of maintaining squareness between table and spindle.

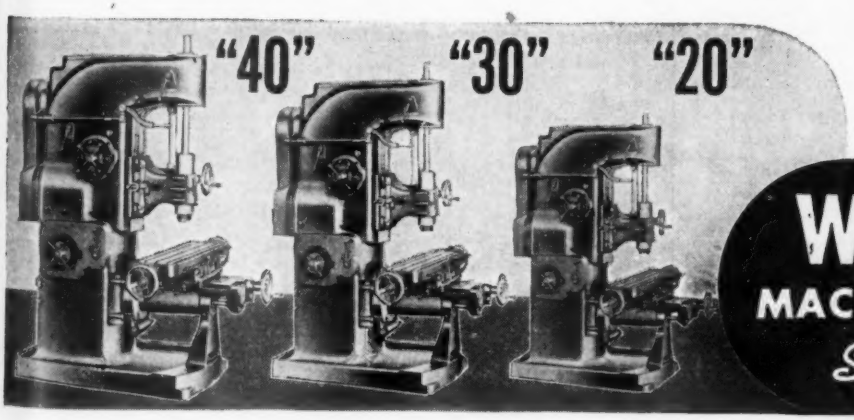
Large worm for operating gear that tilts table unit. Graduated segment on right side of unit gives position of unit in degrees.

Rotary coolant pump located in coolant reservoir in column is belt driven from the motor.

The versatile all-purpose KNIGHT Miller equips you for unusual capacity. Among the reasons for this are wide range of spindle feed, solid table unit, ease of handling. You get speed and accuracy for light milling and power and rigidity for heavy cuts.

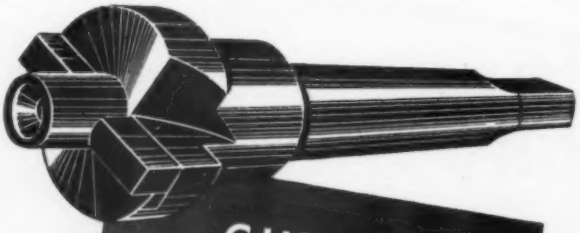
Difficult and unusual parts are handled quickly and accurately without special equipment. You can handle difficult and unusual parts quickly and accurately without special equipment. Internal and external milling is done at one setting.

The many construction features listed contribute to versatility—speed—ability—accuracy—rigidity—accessibility and low cost—all around dependable performance. *Write for catalog.*

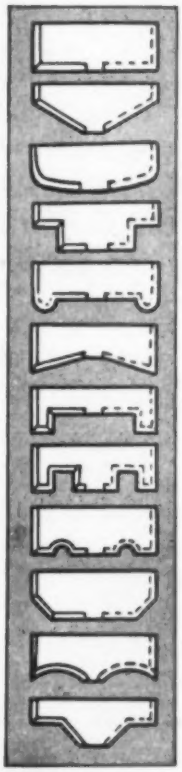


KNIGHT VERSATILE MILLERS ACCURATE - RIGID

W. B. KNIGHT
MACHINERY COMPANY
St. Louis 8, Mo.



CUT OF MANY SHAPES WITH RIEGER MULTIFACERS



Standard cutting bits are used in Multifacers. Bits can be ground to desired contours for spot-facing, counterboring, chamfering, grooving, valve-seating, etc. Some examples are shown at the left.

The three regular models of Multifacers have 1″ to 2½″, 2″ to 4″, and 3″ to 5″ cutting diameters. Straight or tapered shanks regularly furnished. Special models made to order.

Mail coupon or write for complete information on Multifacers and other Rieger tools.

REPRESENTATIVES: Z. W. Brouillard & Co., 43 Kenyon St., Springfield 9, Mass.; Harry E. Hummer, 115 Montclair Ave., Newark, N. J.; N. R. Fisher, 3478 W. 150th St., Cleveland 11; Elliott Machinery, 6 E. Buena Vista, Highland Park 3, Mich.; Tool Equipment Co., Indianapolis 4; Keene Elec. Mchy. Co., 549 N. Washington Blvd., Chicago 6; E. Sherman Hinds & Staff, 2488 W. Pico Blvd., Los Angeles 6 (N. W. States); Schellenbach Mach. & Tool Co., 480 Fifth Street, San Francisco 7; Bridge Machinery Co., 768 St. Paul Street, W., Montreal; Z. W. Brouillard & Co., Rooms 2111-12, 401 Broadway, New York City, Export.

ALLEN TOOL & MFG. CO., (Successors to Rieger Tools)
730 Steele Ave., Dayton 10, Ohio

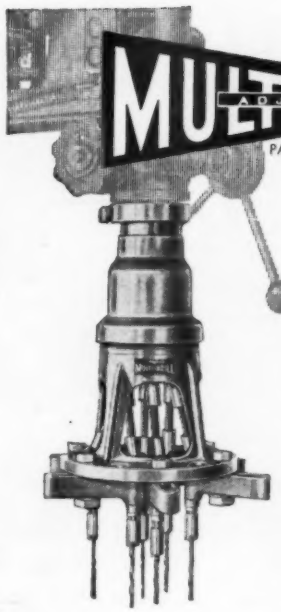
Send complete information on Multifacers, Circle Cutters, Spindle Stops, and Die Holders.

Name

Company

Street Address

City, State



MULTI-DRILL ADJUSTABLE

PATS. PENDING

Drill 6 Holes at One Stroke— Adjustable for *any* Pattern!

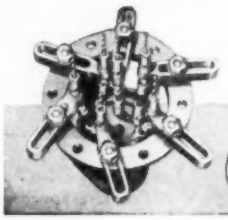
Your drill presses equipped with adjustable MULTI-DRILL heads will

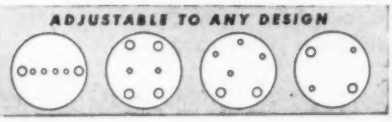
- Reduce costs thru multiplying your present drill press production
- Conserve valuable floor space in your shop or departments
- Reduce your equipment investment
- Often save their cost on the first job

The MULTI-DRILL attaches conveniently to most ½" drill presses. Its six radially adjustable spindles are quickly set to any hole pattern within 5" circle—11/16" minimum centers. Standard capacity 3/32" to 17/64" drills. Many modifications are available for your special applications at slight additional cost.

Write today for circular.

Any Hole Pattern

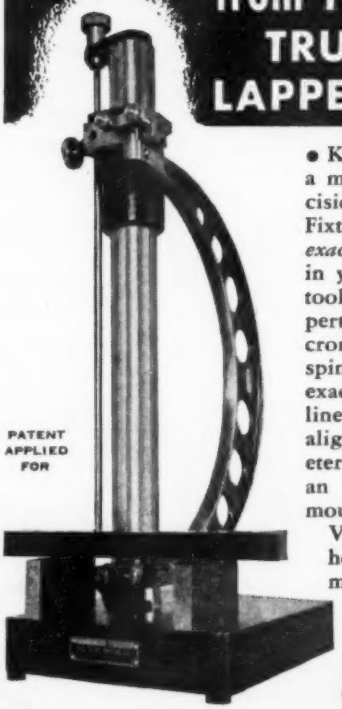




COMMANDER MFG. CO.

4229 Kinzie St., Chicago, U.S.A.

Any MICROMETER from 1″ to 18″ size TRUED AND LAPPED SQUARE



PATENT APPLIED FOR

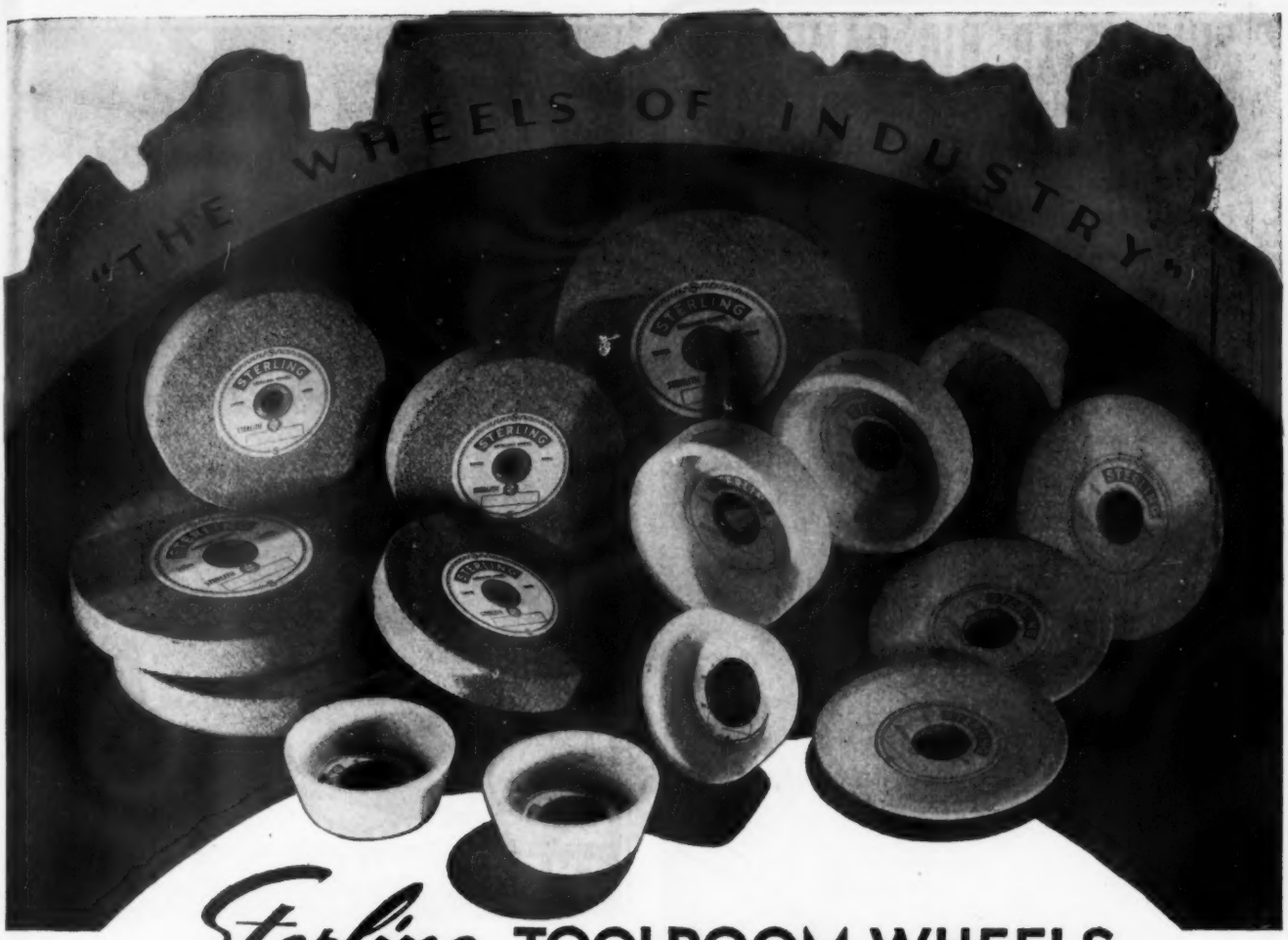
• Keep your shop spoilage to a minimum. The *Pearson* Precision "Micrometer Lapping Fixture" gives you a constant *exact check* on all micrometers in your plant. Any competent toolroom man can operate it expertly. No disassembling of micrometer other than removing spindle. Laps micrometer in exact right angle with center line of spindle; and in perfect alignment with end of micrometer spindle. Device also makes an excellent comparator by mounting an indicator in the V-block. The cost of one hour's rejected work may more than pay for this fixture.

16″ micrometer with lapping bar in position to lap anvil.

Write for Literature

MANUFACTURED BY

RED WING MOTOR CO., RED WING, MINN.



Sterling TOOLROOM WHEELS

help change difficult jobs into easy ones

Speed up production and cut down spoilage by using the finest toolroom grinding wheels available—Sterling!

Today, toolroom grinding demands specialized wheels built to the needs of each individual job. Sterling meets this demand with wheels of proper grain size and hardness to remove stock quickly and secure desired finish.

Sterling Toolroom Grinding Wheels are used for grinding and sharpening broaches, cutters, dies, drills, gauges, hobs, reamers, cams, tools (lathe and planer), Stellite tools, etc. The smooth cutting W Sterlith grain, plus the uniform H and F bonds, does the job.

For fast cutting action on any alloy, specify the "Wheels of Industry" and be certain.

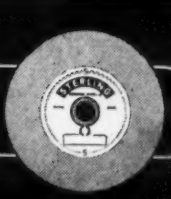
Your Best Industrial Supply Distributor Carries Sterling Wheels In Stock

Send for the Sterling Toolroom Grinding Folder it provides complete specifications for all types of jobs. It's free. Write for it.

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY



"I'M AFTER BIG GAME,
Miss Dingle, NOT RABBITS!"
Big Game Hunters in Business Need Modern Equipment for Big Production. That Means Special Machinery.

FENN
SPECIAL MACHINERY BUILT TO CUSTOMERS' DESIGNS

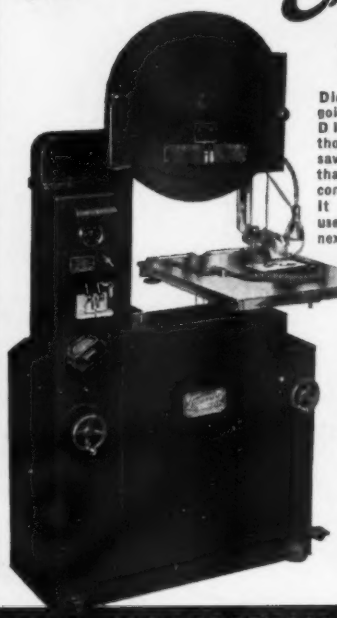
FENN builds special machinery and tools for manufacturers who are going after big game.

Three generations of Yankee know-how. Two modern, up-to-date shops. The very latest precision equipment. Plenty of top-notch men — tool makers, machinists, and engineers — ready to tackle your special machinery problem. *Remember;* if it's special machinery, say when to Fenn.

Send your inquiry to Dept. B.

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

Tannewitz
the DI-SAW with Extra SPEED AND EXTRA STAMINA



Did you ever hear of a transmission going haywire on a TANNEWITZ DI-SAW? No, neither did we, though we have been making die saws for a good many years. And that's just typical of the superior construction of the entire machine. It can take the severest kind of use and always be ready for the next job. Moreover the standard model has larger wheels than customary in machines of this type — a full 24 inches — for greater traction, straighter, faster sawing and more production. Get the complete facts and you'll discover why TANNEWITZ DI-SAWS always show the best possible return on an investment in equipment of this kind. Write for "DI-SAW" Bulletin.

OTHER MODELS TO HANDLE WORK OF ANY SIZE
for dies, jigs and other work too large to handle on the standard machine. Bulletin on request.

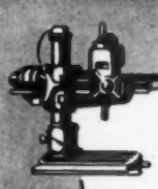
THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio

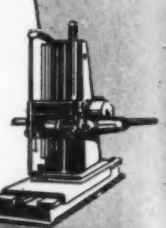
For cutting internal keyways, slots or splines 1/10" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS
MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

GILBERT



PRODUCTION SPEEDING RADIAL DRILLS AND HORIZONTAL DRILLING, BORING AND MILLING MACHINES



DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

LELAND GIFFORD DRILL SPINDLES

Bulletin No. 300 B Fully Describes

***The* HEAT TREATED ALLOY STEEL SPINDLES For LELAND GIFFORD No. 2 LMS DRILLING MACHINES** ARE MOUNTED IN PRELOADED COMBINATION RADIAL AND THRUST BALL BEARINGS.

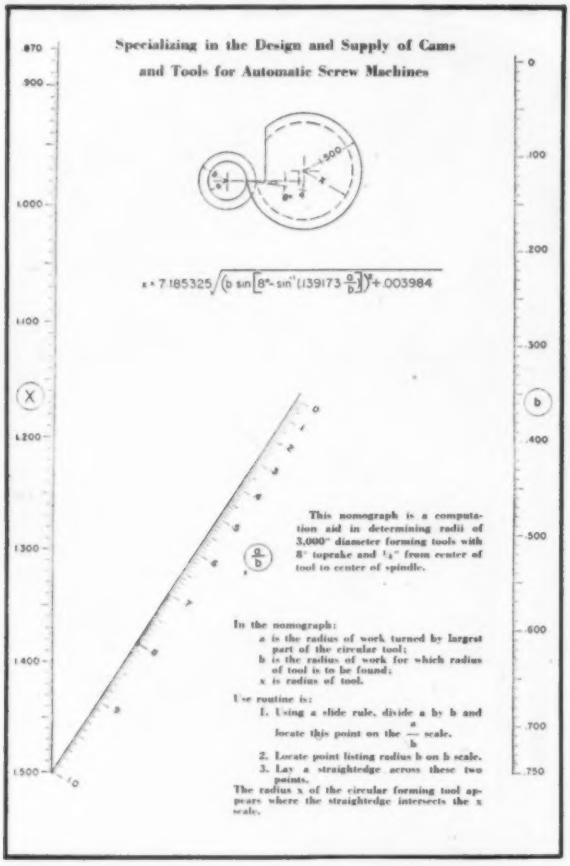
Oil Mist Lubrication insures proper oiling at All Speeds. Six Hobbed Splines Oiled by a Felt Wiper at Every Stroke insures Smooth Feed Action by means of the Steel Rack which is key seated into the Semi-Steel Quill. An easily adjustable, positive depth stop mounted at eye level permits quick and accurate setting for depth.

LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

FREE!

NOMOGRAPH CHART FOR No. 2 BROWN & SHARPE AUTOMATIC SCREW MACHINES!


Specializing in the Design and Supply of Cams
and Tools for Automatic Screw Machines
This nomograph is a computation aid in determining radii of 3.000" diameter forming tools with 8° toprake and ¼" from center of tool to center of spindle.
In the nomograph:
a is the radius of work turned by largest part of the circular tool;
b is the radius of work for which radius of tool is to be found;
x is radius of tool.
Use routine is:
1. Using a slide rule, divide a by b and locate this point on the a/b scale.
2. Locate point listing radius b on b scale.
3. Lay a straightedge across these two points.
The radius x of the circular forming tool appears where the straightedge intersects the x scale.

This Nomograph is a computation aid in determining radii of 3,000" diameter forming tools with 8° top-rake and ¼" from center of tool to center of spindle.

Godfrey Tool and Design Co. will gladly send you an 8 x 10 copy of the above Nomograph upon request.

There is real production economy when you use the Specialized Engineering Service of Godfrey Tool and Design Co. We provide an engineering department for plants unable to maintain a full staff and in need of engineering for automatics.

Here's how we work with you:

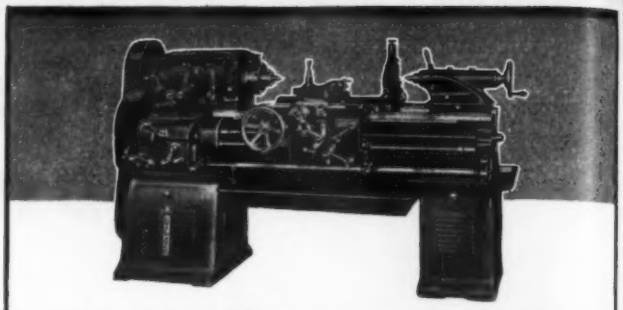
1. Consultation on product design
2. Consulation on processing
3. Design of Setups
4. Design of Tools
5. Supplying of Tools
6. Trouble Shooting

That's a brief outline. Why not get to know us? Write today for your copy of the Nomograph . . . and if you have any engineering problems—tell us!

Godfrey Tool and Design Co.

1528 Walnut Street, Philadelphia 2, Pa.

Phone: PENnypacker 4780



BRADFORD *Metalmaster* LATHE have this standard equipment

- 12-Speed Timken Geared Headstock
- Quick Change Gear Device
- Double Wall Apron
- Tailstock
- Compound Rest
- Tool Post with Ring, Wedge, Square
- Steady Rest
- Face Plate
- Dog Plate
- Head Center Bushing
- Chasing Dial
- 2-Centers
- Wrenches
- Motor Mounting and Wiring
- Push Button and Starter
- Vee Belt Drive
- Automatic Lubrication in Head
- Cabinet Legs on Head and Tailstock End of Bed
- Lever Control for Length and Cross Feeds
- Mechanical Apron Clutch Control
- Threaded Spindle Nose

The BRADFORD MACHINE TOOL CO.

1840—1945 CINCINNATI, OHIO

Sensitive DRILLING MACHINES

Avey

CINCINNATI OHIO

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

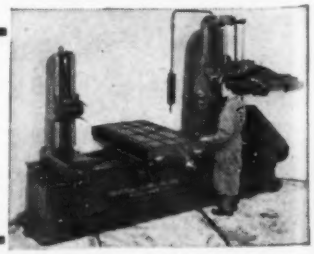
Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3", 4" and 5" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.

Hudson, Mass., U. S. A.

136 ROCKER ARMS PRODUCED PER HOUR

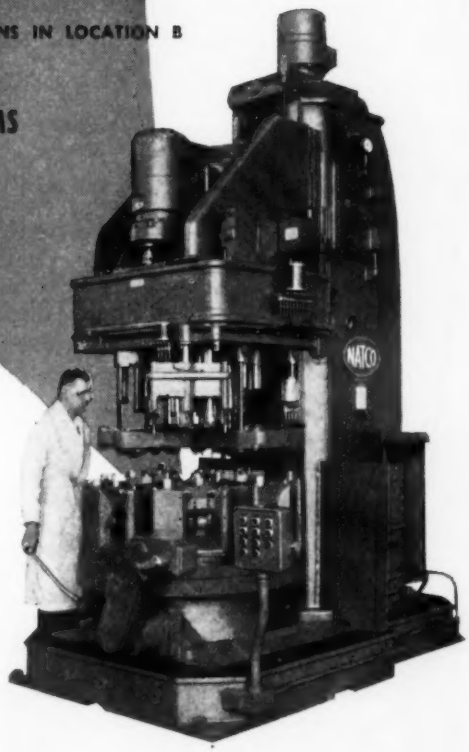
12 INDIVIDUAL OPERATIONS ON EACH PART WHILE UNLOADING AND LOADING

using NATCO HOLESTEEL MACHINE WITH ROTATING TABLE

LET NATCO SOLVE YOUR HOLE PRODUCTION PROBLEMS

NATCO Vertical HOLESTEEL Machines with rotating tables have proved to be the answer to many difficult production problems . . . problems involving a multiplication of operations on one or several holes where maximum production is required.

The rocker arms shown above were produced in both right-hand and left-hand types. With NATCO HOLESTEEL Machines, twelve individual operations were performed on each of 68 left- and 68 right-hand parts per hour.



LOCATION A

POSITION 1	POSITION 2	POSITION 3	POSITION 4	POSITION 5	POSITION 6	POSITION 7
Unload and load 2 parts	Drill for .875 x 18 Tap	Combination ream and chamfer	Counterbore to diameter	Undercut radius slot	Chamfer bottom of hole	Tap hole

LOCATION B

POSITION 1	POSITION 2	POSITION 3	POSITION 4	POSITION 5	POSITION 6	POSITION 7
Unload and load 2 parts	Drill for .250 x 28 tap	Ream two diameters	Counterbore	Finish counterbore to depth	Taper ream	Tap hole

NATCO Field Engineers are at your service to analyze your Hole Problems

National Automatic Tool Company, Inc., Richmond, Ind.

MULTIPLE DRILLING, BORING, AND TAPPING MACHINES

INVESTIGATE NATCO METHODS FOR THE LOWEST POSSIBLE HOLE COSTS!

SALES OFFICES: 1909 ENGINEERING BUILDING, CHICAGO; 400 NEW CENTER BUILDING, DETROIT; 1807 ELMWOOD AVENUE, BUFFALO; 2902 COMMERCE BUILDING, NEW YORK CITY

Tomorrow is here! Industry is starting a peacetime production scramble that will not permit uneconomical manufacturing methods.

Now is the time to evaluate your production equipment. Now is the time to junk obsolete machine tools. Now is the time to investigate the production possibility of tools like the Hendey 12" High Speed Shaper.

Here, in the Hendey Shaper, is a versatile machine for both the tool room and production line. It is accurate beyond the usual conception—completely free from vibration — designed for maximum production with minimum operator fatigue. It is truly "the shaper of things to come" and it will shape these things quickly, accurately and economically.

Regardless of the products that you make, there is a place for Hendey shapers in your plant—to earn you a profit. Write for details on these modern machines.

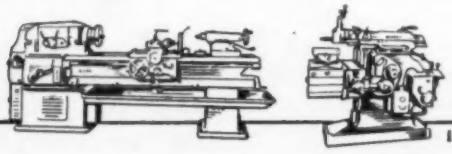
The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Branch Offices — New York, Chicago, Boston, Detroit, and Rochester

Representatives in — Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco



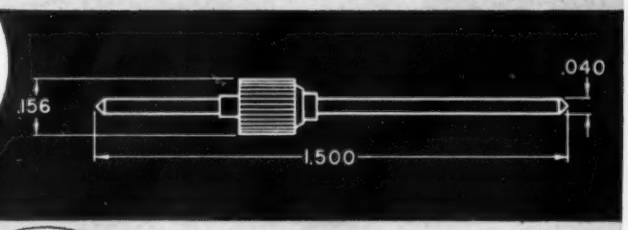
TOOL ROOM LATHES
12" - 16" - 18"

SHAPERS
12" - 16" - 20" - 24" - 28"

Compare PRODUCTION TIME AND COSTS

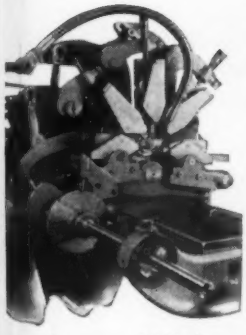
ON WICKMAN AUTOMATICS

ONE PIECE FROM PINION STEEL



THREE PIECES *Plus* DRILLING KNURLING AND ASSEMBLY OPERATIONS

by **CONVENTIONAL PRODUCTION METHODS**



IN the production of innumerable parts such as that illustrated, Wickman Automatics offer a positive method of saving time, labor and equipment costs. In addition, these parts can be made on Wickman machines to a higher degree of accuracy and with finer finishes than can be secured by the use of conventional screw machines and second-operation work.

Wickman Automatics are available in two sizes—the No. 1 machine of 5/32" chuck capacity and the No. 2 (of which the tool head is illustrated) of 1/2" capacity. The operating principle of both machines provides for the turning of pivot points and tapers of any angle, multiple diameters, back shoulders, recesses and irregular contours in a single operating cycle. Complete lines of attachments for performing centering, drilling, counterboring, reaming, tapping, threading or slotting operations are available for both models.

Take a look at some of your small assemblies. Then determine for yourself how Wickman Automatics can give you better than their equivalent *in single pieces*—faster and more economically. We will be glad to send full information.

If you are looking for a source of Swiss Automatic parts—either to handle all of this type of work which you require or to supplement your present production—we will be glad to put you in touch with thoroughly dependable contract manufacturers operating batteries of Wickman Automatics in plants located near you.

THE Wickman CORPORATION

1553 WOODROW WILSON AVE., DETROIT 3, MICH.

A. C. Wickman (Canada), Ltd., P. O. Box 9, Station N, Toronto, Ontario

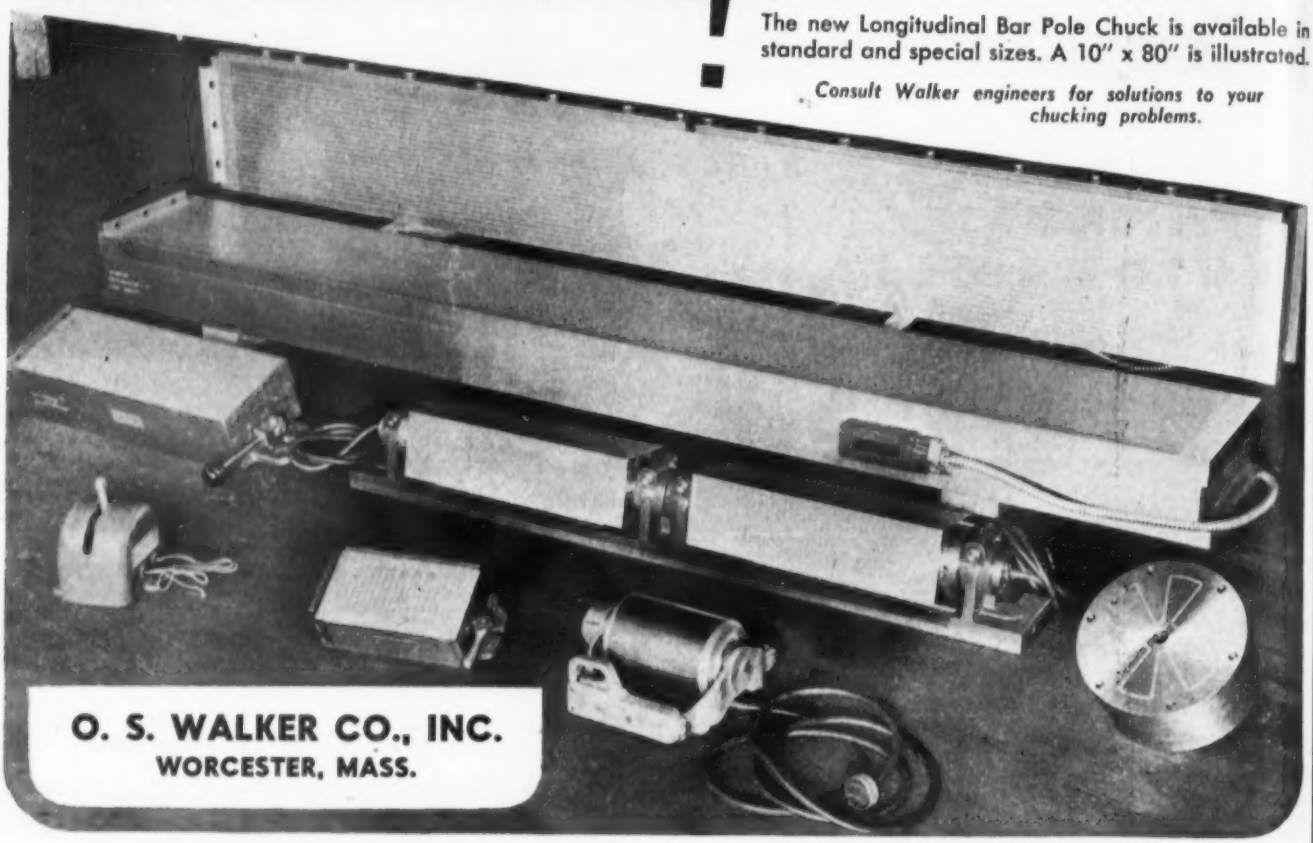
Branch Offices: 1060 Broad St., Newark 2, N. J. • National City Bank Bldg., Cleveland 14, Ohio • Civic Opera Bldg., Chicago 6, Ill.

WALKER does it AGAIN!

Walker engineers anticipated future developments and incorporated improved designs to serve industry's requirements.

The new Longitudinal Bar Pole Chuck is available in standard and special sizes. A 10" x 80" is illustrated.

Consult Walker engineers for solutions to your chucking problems.



O. S. WALKER CO., INC.
WORCESTER, MASS.

"BUZZER" HIGH SPEED *Gas* FURNACES

Attain High Temperatures

without BLOWER or POWER
. . . just connect to gas supply

FULL MUFFLE FURNACES . . . reach temperatures of 2400° F. without blower or power. Ideal for heat treating high speed and Alloy Steels. Also available in Bench Models.

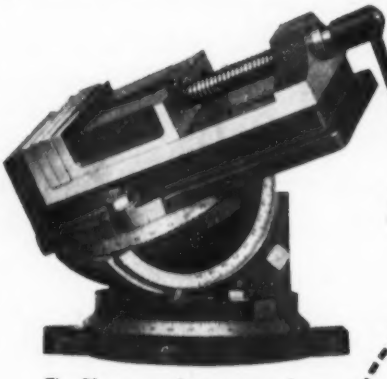
ATMOSPHERIC POT HARDENING FURNACES . . . tangentially-fired to assure even heat up to 1650° F. are used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

Send for the complete "BUZZER" Catalog

CHARLES A. HONES, INC.
121 So. Grand Ave. Baldwin, L. I., N. Y.

SAVE TIME ON INTRICATE
★ ANGULAR SET-UPS ★

MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles.

Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or a multi-swivel vise.

The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

Write for name of nearest distributor

MASTER TOOL CO.
161 HIGH STREET • BOSTON, MASS.

WORN CUTTERS AND TOOLS
GET BACK INTO ACTION
F-A-S-T
WITH THE
COVEL No. 22 UNIVERSAL

Grinding corners of large face milling cutters to insure longer life, with large radius grinding attachment installed on Covel No. 22.

Capacity — face-milling cutters from 2" to 14" dia. Radius concave or convex from 0" to 2".

Toolroom technique is simplified, when a Covel No. 22 Universal is on the job. Set-ups are quickly and easily changed on this versatile cutter and tool grinder. And the No. 22 does such an accurate, thorough job that the useful life of cutters and tools is often greatly increased.

See Your Nearest Covel Dealer or Write for Bulletin A-245.

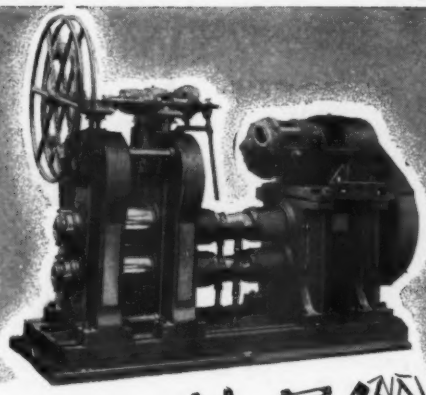
GRINDING MACHINERY SINCE 1874

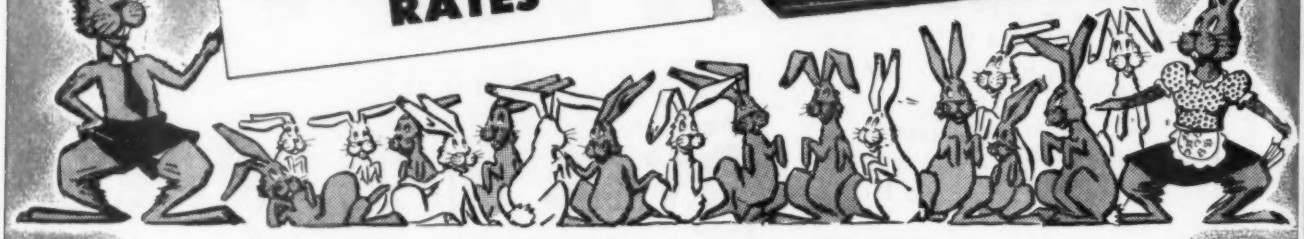
COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

"Standard" ROLLING MILLS

for HIGH PRODUCTION RATES





"Standard" Rolling Mills assure high production hot or cold rolling of your strip, rod or ingot. Speeds are provided for rolling metals in any range from 10 feet to 500 feet per minute, depending upon your needs. Two, Three, or Four High Mills are available with roll sizes from 1½" diameter and 1" face to 16½" diameter and 18" face.

"Standard" manufactures special units for grading, cross and pinch rolling, forming wire to exact dimensions, and for a large variety of shaping operations.

CATALOG SECTION RM AND DETAILED RECOMMENDATIONS WILL BE SENT UPON REQUEST.

STANDARD MACHINERY COMPANY
1565 ELMWOOD AVE., PROVIDENCE 7, R. I.

Returns ITS *LOW COST* IN QUICK PROFITS

The compact, sturdy LINLEY provides, at low initial investment, the machining ability to handle the many small jobs that continually confront busy toolmakers. In making dies, jigs, fixtures, metal patterns and models, set-up is fast, change-over easy.

Choose from 8 speeds (275 to 4250 r.p.m.) . . . use direct micrometer for accurate settings . . . benefit from the smooth feed, grease-sealed bearings; with no backlash in quill travel.

It is poor policy to use large, expensive machines for small jobs when the LINLEY can handle most of them on its 7"x17½" table . . . accurately, with speed, at lower costs.

There's a need for one or more LINLEYS in many shops. Investigate its advantages today.

BULLETIN on request

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

SIGOURNEY M-100

BUILT-IN PRECISION FOR HIGH SPEED DRILLING

Strength and sensitivity are combined in the Sigourney M-100 Drilling Machine for work where high speed precision is a prime requisite. It is engineered for the utmost accuracy and long service life. Completely enclosed parts insure operator safety and sealed ball bearings give smooth performance in 4,000 to 10,000 standard speed ranges, with additional ranges available. M-100 is produced in models from 1 to 6 spindles.

Send for Illustrated Bulletin

THE SIGOURNEY TOOL CO.
Hartford 6, Conn.

Sole Sales Agents
PRATT & WHITNEY
Division Niles-Bement-Pond Co. West Hartford, Connecticut

The Standard Man

Alert to Your Present Problems

HIS business is to help you meet *today's* production problems with efficiency and economy.

Usually he can select from a stock of thousands of Standard Shield Brand Tools the drill, reamer, tap, die, or milling cutter that will do the best job for you.

If your problem is unusual or difficult, he brings you the benefit of this Company's 64 years of experience in helping solve tough metal cutting problems for America's most exacting users in the Aviation, Automotive, Farm Implement, Transportation and Electrical industries.

The Standard Man, whether factory or mill supply distributor representative is a good man to know, because he knows his business. His service and suggestions are yours without obligation. For prompt attention to your present requirements, call or write

Red Shield Brand
TWIST DRILLS
REAMERS
MILLING CUTTERS
TAPS · DIES
SPECIAL TOOLS

THE STANDARD TOOL CO.

CLEVELAND

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94 READE STREET

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552 W. WASHINGTON BLVD.

STANDARDIZE

How Far ? ?

NO one argues about Standardization of methods, procedures, and products as a means to reduce costs, and thus maintain a competitive position with fair profit margins.

Many makers have found added profits in Standardizing on one make of metal cutting tools—that is, Standard Shield Brand Drills, Reamers, Taps, Dies, Milling Cutters, and Special Tools.

These tools are manufactured in one plant, under the same laboratory control of materials, the same skilled supervision, the same rigid standard of inspection.

Result, all of these types of Shield Brand Tools are uniform in economical performance. Workmen like them—they help your program to Standardize and thus reduce costs. Why not try them?

Leading Industrial Supply Distributors from coast to coast gladly furnish your requirements for Standard Shield Brand Drills, Reamers, Taps, Dies, Milling Cutters and Special Tools.

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The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.

As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

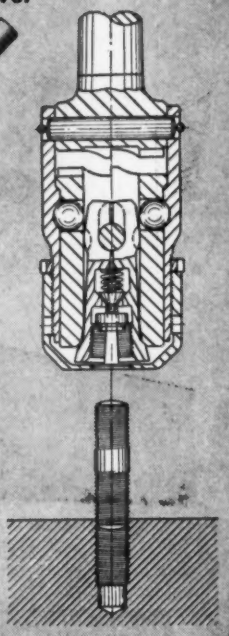
At the top . . . jaws open to take the stud.

Middle . . . driving position, jaws locked on stud.

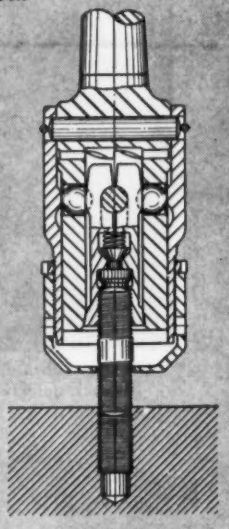
At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

The tool revolves in one direction, no reversal, for the complete job.

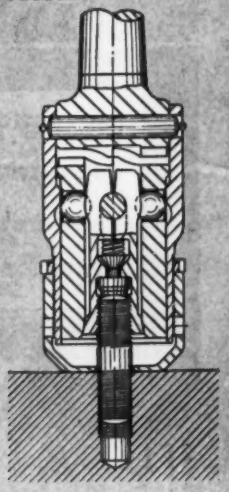
Tool brought to positio over stud, about to begi drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

"Takes me a Lot Less Work to get More Work Done..."

(Color on the Tang is Trademarked)

Special *Red Tang* Long-Angle Lathe File removes stock quickly and smoothly, without clogging.

...with SIMONDS *RED-TANG FILES"*

Workers like *Red Tang* Files because they can remove more stock with less elbow-grease. And management likes them because they stay sharp and last longer, giving more "file-mileage" per dollar. *Red Tang* Files cut (instead of scrape) with teeth designed like the teeth of a Simonds metal-cutting saw . . . curl up long, even chips.

Made under ideal conditions in the world's first windowless plant, Simonds *Red Tang* Files come in only one quality . . . the highest standard to which *any* file can be made. So next time you need standard files, tell your dealer specifically to send you Simonds *Red Tang. Then measure the extra value you get.*

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. 8th St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Wash.

PRODUCTION TOOLS FOR CUTTING METAL, WOOD, PAPER, PLASTICS

SIMONDS SAW AND STEEL CO.
FITCHBURG, MASSACHUSETTS

CUT THE WAR SHORT... BUY WAR BONDS... AND THEN BUY MORE WAR BONDS

GAGES

Two things you look for when selecting Gages—initial accuracy and maintained accuracy.

Gages bearing the PM Diamond Emblem qualify on both of these excellent family characteristics.

Beginning with the right steel, we machine and grind to the high standards demanded by today's precision work, and then finish to insure long life in service.

Pipe Machinery maintains a large stock of standard Plug, Ring and Thread Gages, from which prompt shipments are made to meet emergencies. Wire Department EX for this quick delivery service.

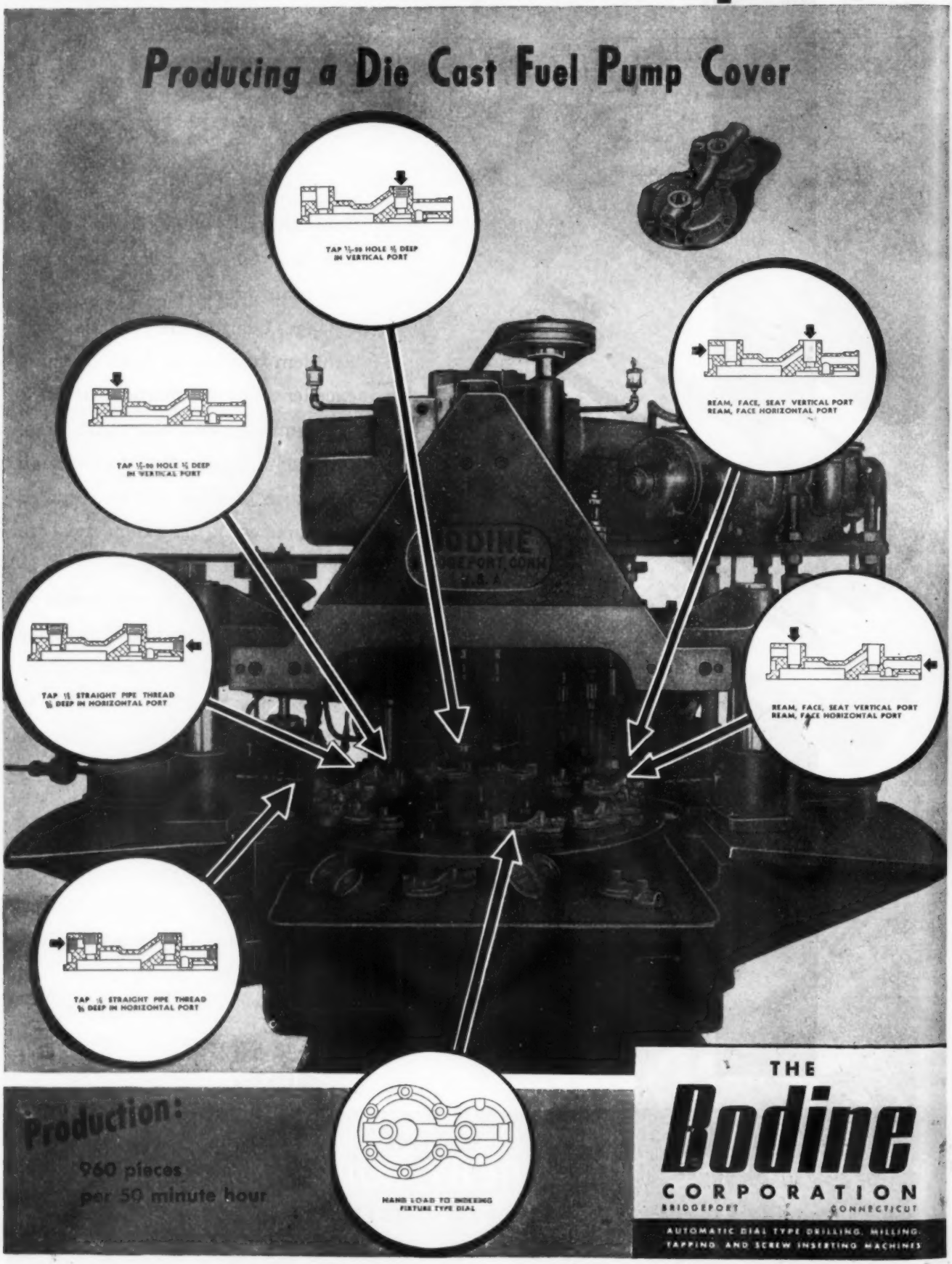
Special Gages and Cutting Tools are engineered by experts and built on special order. Send us details of what you want to accomplish

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

Bodine...Case History No. 14

Producing a Die Cast Fuel Pump Cover


TAP ⅞-20 HOLE ½ DEEP IN VERTICAL PORT
TAP ⅞-20 HOLE ½ DEEP IN VERTICAL PORT
REAM, FACE, SEAT VERTICAL PORT
REAM, FACE HORIZONTAL PORT
TAP ½ STRAIGHT PIPE THREAD ⅝ DEEP IN HORIZONTAL PORT
REAM, FACE, SEAT VERTICAL PORT
REAM, FACE HORIZONTAL PORT
TAP ½ STRAIGHT PIPE THREAD ⅝ DEEP IN HORIZONTAL PORT
HAND LOAD TO INDEXING FIXTURE TYPE DIAL

Production:

960 pieces per 50 minute hour

THE

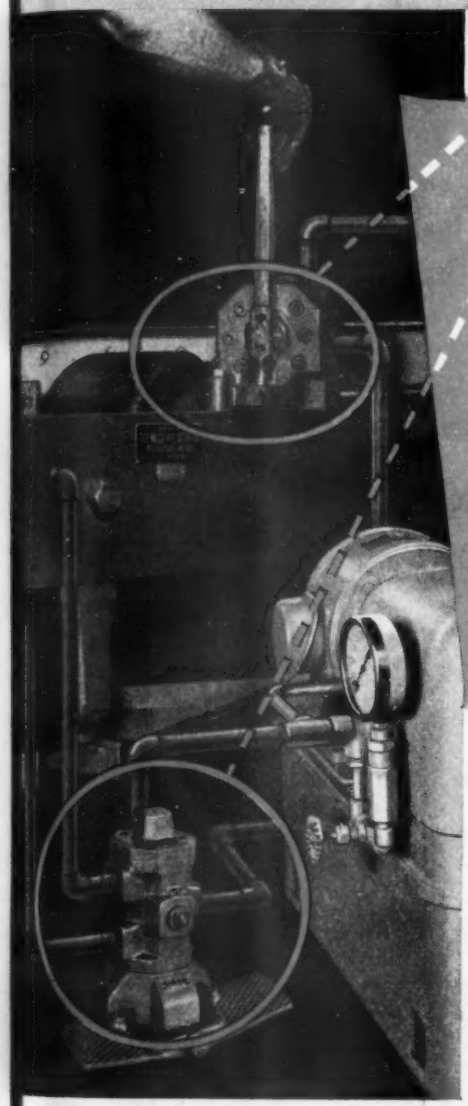
Bodine

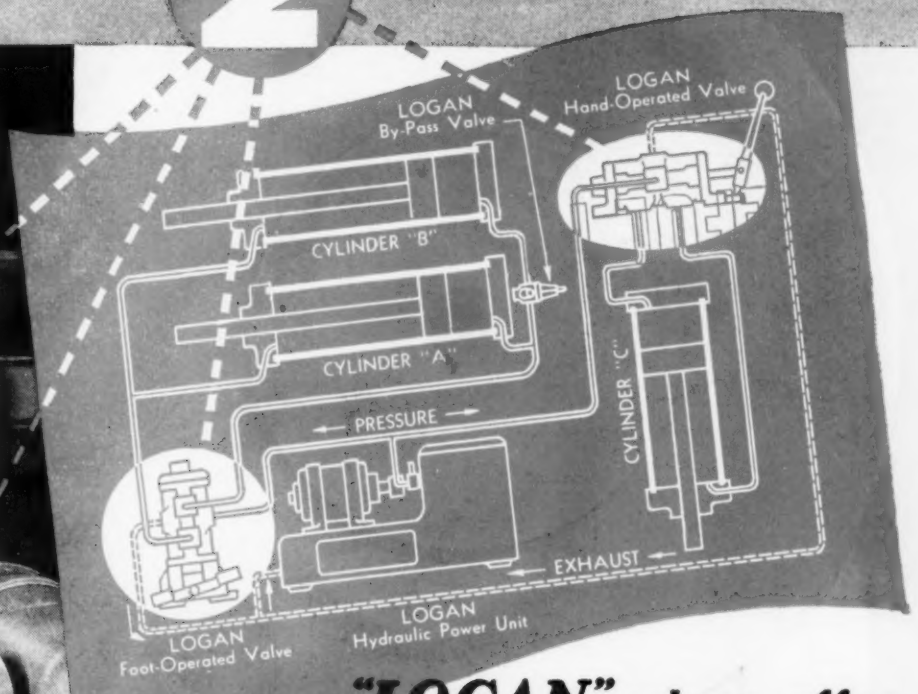
CORPORATION

BRIDGEPORT CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

6 HYDRAULIC MOVEMENTS CONTROLLED BY 2 STANDARD VALVES

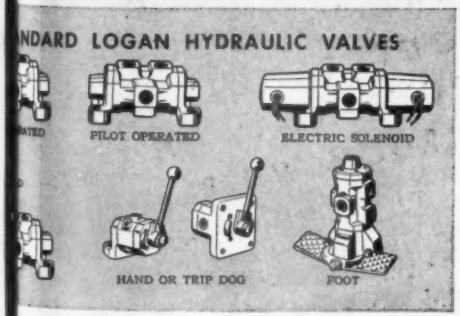




Standard "LOGAN" valves offer the most efficient type of control for every hydraulic application

Two double-acting hydraulic cylinders operating in sequence are controlled by a single Logan foot-operated hydraulic valve in this application. Pressing one treadle directs oil to the blind end of both cylinders; a Logan by-pass valve regulates Cylinder "A" to its outstroke, after which Cylinder "B" starts operation. Pressing the other treadle directs full line pressure to the rod end of both cylinders. The hand-operated Logan hydraulic valve controls a third double-acting cylinder (Cylinder "C") used for a pressing operation.

Standard Logan hydraulic valves permit manual or foot, remote, semi-automatic, automatic, time delayed, interlocking and sequence control of single and double-acting cylinders. Hand-operated valves are available for *oil service* in plain, latching, spring return and open center types; for *water service* in plain and spring return types. Other 4-way control valves include foot, electric solenoid, cam-operated and pilot-operated models. The pilot-operated valves are furnished for either air or hydraulic operating valves. A complete line of relief, reducing, by-pass and speed control valves is also available.



ENGINEERING HELP

Refer your hydraulic circuit problems to Logan engineers for careful analysis and recommendations. Layouts furnished. No obligation for this service.

FREE LITERATURE

Get your copy of Catalog 80, Section 3 on Logan hydraulic control valves. Also ask for literature on Logan cylinders and hydraulic power units.

Logan

ARMY-E AWARD

SAVES ★TIME ★EFFORT ★MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC.

918 CENTER AVE. LOGANSPORT INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE-FLOW COOLANT PUMPS

INDUSTRY ACCEPTS THE NEW

MACKLIN COMPANY
Manufacturers of **GRINDING WHEELS**
JACKSON, MICHIGAN, U. S. A.
Distributors in all principal cities

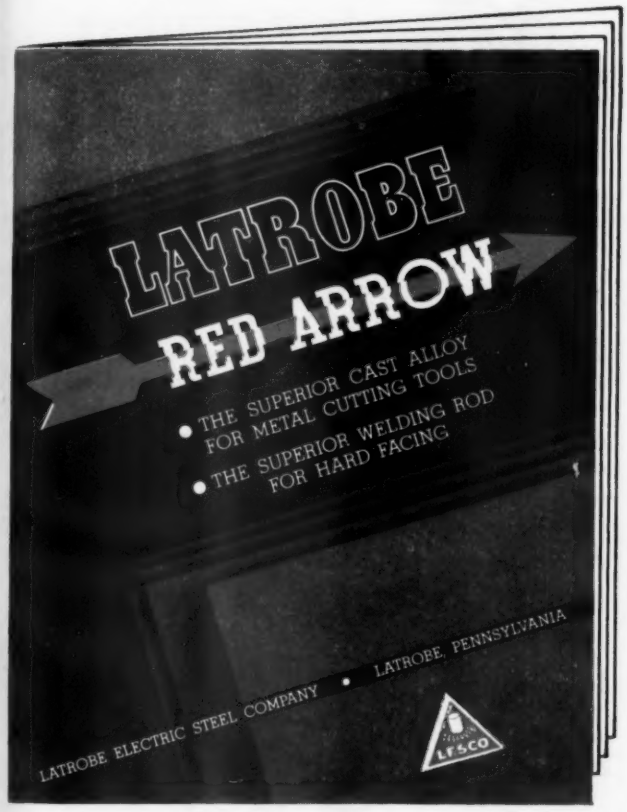
Sales Offices: Chicago • New York • Detroit • Pittsburgh Cleveland • Cincinnati • Milwaukee • Philadelphia

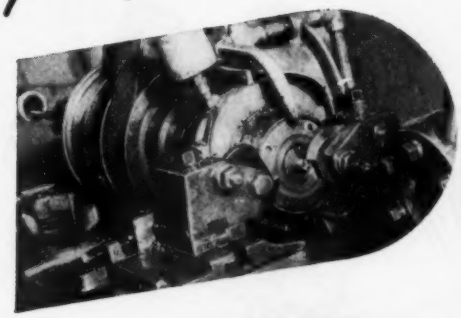
Write for illustrated booklet T-45 which tells the story of the development of these new, improved bonds and also gives complete specifications and recommendations for all types of tool room grinding.

LATROBE

RED ARROW

described in this new pamphlet - now ready!

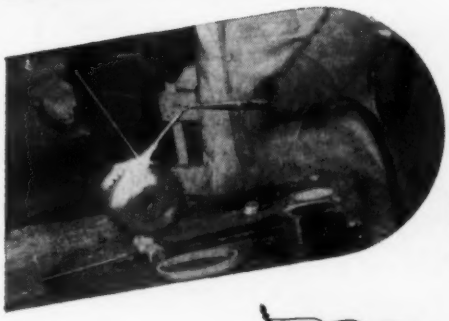

LATROBE
RED ARROW
• THE SUPERIOR CAST ALLOY FOR METAL CUTTING TOOLS
• THE SUPERIOR WELDING ROD FOR HARD FACING
LATROBE ELECTRIC STEEL COMPANY • LATROBE, PENNSYLVANIA
LESCO



For Screw Machines

For Facing and Boring

For Milling



For Hard Facing

You will want to have a copy of this pamphlet for ready reference. It gives the various applications for this superior cast alloy.

Used in a multitude of cutting and machining operations, Latrobe Red Arrow operates at speeds and feeds beyond those attainable with high speed steels.

Latrobe Red Arrow is available in the form of tool bits and cut-off blades, and is also supplied cast to shape. It is also furnished in three grades of welding rod for hard facing.

Why not send for a copy of this new pamphlet today?

ARMY (E) NAVY

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

LESCO

R-5

"GREENFIELD MAN" SHOWS HOW TO ELIMINATE THREADING BOTTLE-NECK WITH "ACORN" DIE

[A GTD SHOW-HOW REPORT]

1 A "Greenfield Man" on a routine service call at a large plant in New York State was told by the Tool Supervisor that they had to finish threading a certain part by hand because the threading operation on the turret lathe was producing tapered threads. "It is a major headache," said he.

2 "That looks like a 'natural' for one of our 'Acorn' Dies," said the "Greenfield Man". He located an "Acorn" Die Releasing Type Holder in another department which he adapted to fit turret of machine by having shank ground down from ¾" to ⅝".

3 While shank of holder was being adapted to fit turret, the "Greenfield Man" phoned local "Greenfield" Distributor and asked him to send over two "Acorn" Dies from the distributor's stock right away.

4 Before the "Greenfield Man" left the plant, this emergency "Acorn" Die set up was running smoothly producing perfect threads, and an order was placed for the correct size holder

Results!

A needless operation was eliminated. Production time was cut to a fraction and a serious bottle-neck eliminated. Value of on the spot show-how service by "Greenfield Man" and quick delivery from stocking "Greenfield" Distributor was demonstrated.

Greenfield's SHOW-HOW is KNOW-HOW in action!

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD • MASSACHUSETTS

GEOMETRIC

Simple . Accurate . Economical

DIE HEADS THAT LICK TOUGH THREADING PROBLEMS

The tougher the threading job, the greater has been the challenge to Geometric to devise a die head that would lick it.

For example — to cut taper threads on hand screw machines, turret lathes, and other similar equipment has always been a tough job. The usual method has been by means of a jam cut, i.e. the taper being in the chasers of the die head.

But this method, especially in threading tough materials, has its drawbacks. For example, the longer the cut, the more power required and the greater the *strain* on the chasers. Also the length of the taper is limited by the height of the chasers. And finally, jam cut chasers often leave lines on the work.

Geometric's answer to all these problems has been the development of its Style CT Taper Die Head. It makes cutting taper threads simple and easy.

Less Power

Because the Style CT Taper Die Head cuts a taper thread just as an ordinary die head cuts a straight thread — with the chamfer plus the first full tooth doing the work.

Greater Lengths

Because the length of the taper is not limited to the height of the chaser, as is the case with a jam cut.

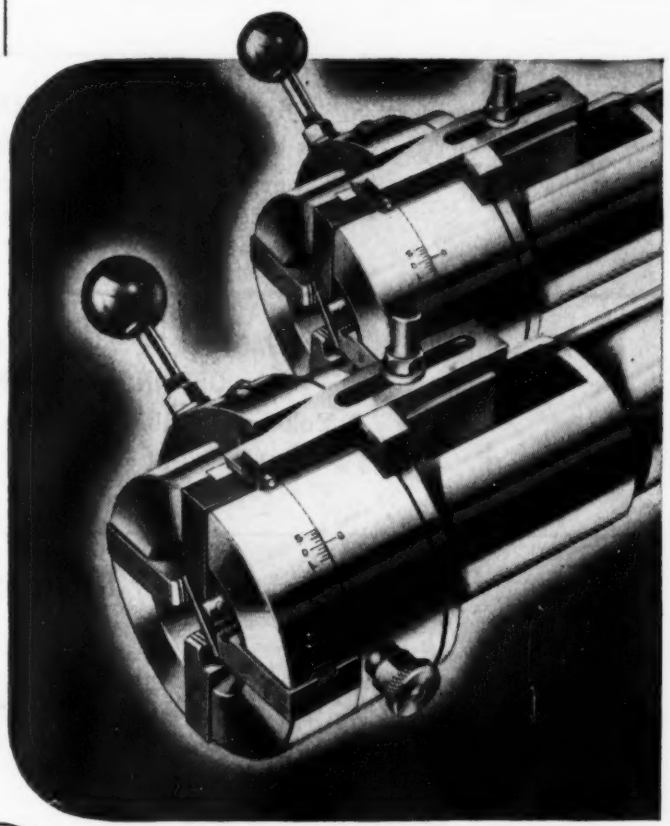
Greater Accuracy

Because the taper on the finished thread is controlled by a positive angle on the taper bar.

In addition, the Geometric Style CT Taper Die Head can cut steeper tapers because of less power required, and it leaves no lines on the work when the tool opens.

THE RESULT: Geometric has developed a die head (Style CT Taper) which cuts better, smoother, and more accurate taper threads at less cost per thread. This is only one of many Geometric tools which are now ready to meet tomorrow's demand for better performance at less cost.

Geometric Style CT Taper Die Head Cuts More and Better Taper Threads At Less Cost Per Thread. Send For Free Catalog Today.

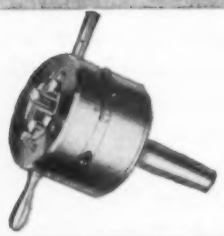


The GEOMETRIC TOOL COMPANY
New Haven 15 Connecticut

A DIVISION OF THE GREENFIELD TAP and DIE CORPORATION

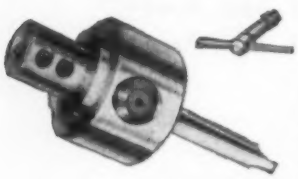
Rickert Shafer

FOR 35 YEARS



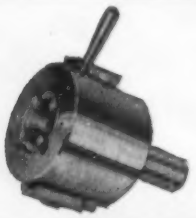
R-S MODEL "F" AUTOMATIC DIE HEAD

Reset automatically or manually with ¼ turn of handles—opens by pull-off method—stationary, the work revolves.



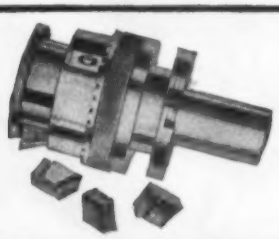
R-S ADJUSTABLE BORING HEAD

.001" Micrometer adjustment 3 sizes for any drilling, turning, or boring machine.



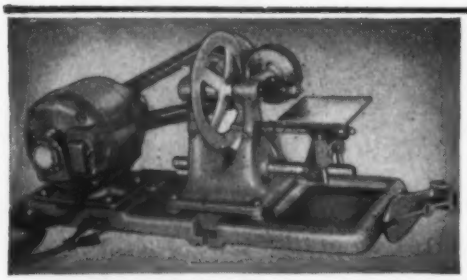
R-S MODEL "T" DIE HEAD FOR TAPER THREADING

Taper controlled exactly by profiles on outside. Leaves no chaser marks on work when Die Head releases.



R-S MODEL "C" AUTOMATIC SELF-OPENING DIE HEAD

Yoke controlled tripping and closing—revolving type. Sizes from 9/16" to 2".



R-S BENCH TAPPER

Motor driven, push to tap—pull to reverse. Sizes 3/16" and 5/16".

RICKERT-SHAFER CO · ERIE, PA.

DIE HEADS · COLLAPSIBLE TAPS · BORING HEADS
TAPPING MACHINES · SPECIAL THREADING MACHINES

IMMEDIATE DELIVERY

No. 1 to 60
New High Speed
Long Length

DRILLS

No. by Gage	*Length*	*Our Price Net Each*
1 to 10	6¼"	$.90
11 to 20	5¾"	.80
21 to 30	5⅜"	.70
31 to 40	5¼"	.60
41 to 50	4½"	.50
51 to 60	4¼"	.40

If you buy 24 or more—10% Discount
If you buy 60 or more—20% Discount
If you buy 100 or more—25% Discount

VICTOR
MACHINERY EXCHANGE
INC.
251 CENTER STREET
NEW YORK N. Y.

RIGHT... down the line in types and sizes

You'll find all types and sizes of Bay State Grinding Wheels for all types of work ... RIGHT, down the line. Centerless grinding, cylindrical grinding, disc grinding, internal grinding, snagging, cutting-off, etc. . . . Sizes, shapes, bonds, grades, grains, and structures to meet specific requirements right.

And once you have determined on a type and size that suit your job right, you can expect to get the very same qualities on repeat orders. "Top performance, consistently duplicated" results from extremely close control over materials and manufacturing processes plus such Bay State features as

"Fractional Grades"— 3 degrees of hardness within every grade; developed to permit a closer fit of grit to grind.

"Controlled Porosity" — a precise method of spacing cutting units which not only makes closer selection possible but also exact duplication.

Such a combination of features are your assurance of getting grinding wheels that are RIGHT — down the line. So whatever your needs for grinding wheels, look into the advantages offered by Bay State's complete line. Write for bulletin to get additional facts.

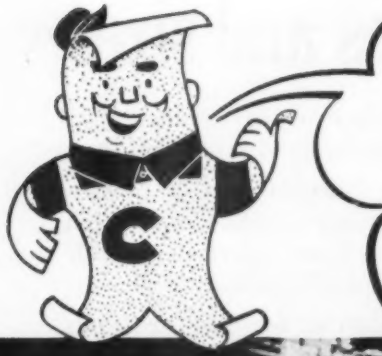
BAY STATE ABRASIVE PRODUCTS CO.
1 Union Street, Westboro, Mass.

BAY STATE

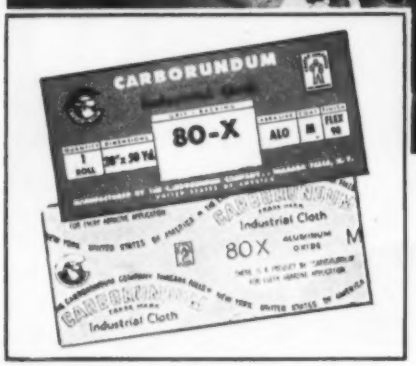
ABRASIVE PRODUCTS

Top Performance Consistently Duplicated

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS · AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS · AND CYLINDERS



HERE'S HOW TO GET THE RIGHT COATED ABRASIVE — everytime!



NOW the Coated Abrasives by "CARBORUNDUM" have the specifications clearly and simply marked on *both* the labels and backing materials! Thus, when the material is in use in the shop, you can tell what to requisition from the stockroom. And the stockroom, from either labels or backing material can tell at a glance what to ask the purchasing department to reorder. A glance at the picture of label and backing will tell you how this new marking system for Coated Abrasives by "CARBORUNDUM" makes it easy to identify, specify and order this popular line of coated abrasive products. The Carborundum Company, Niagara Falls, New York.

THERE IS A PRODUCT BY

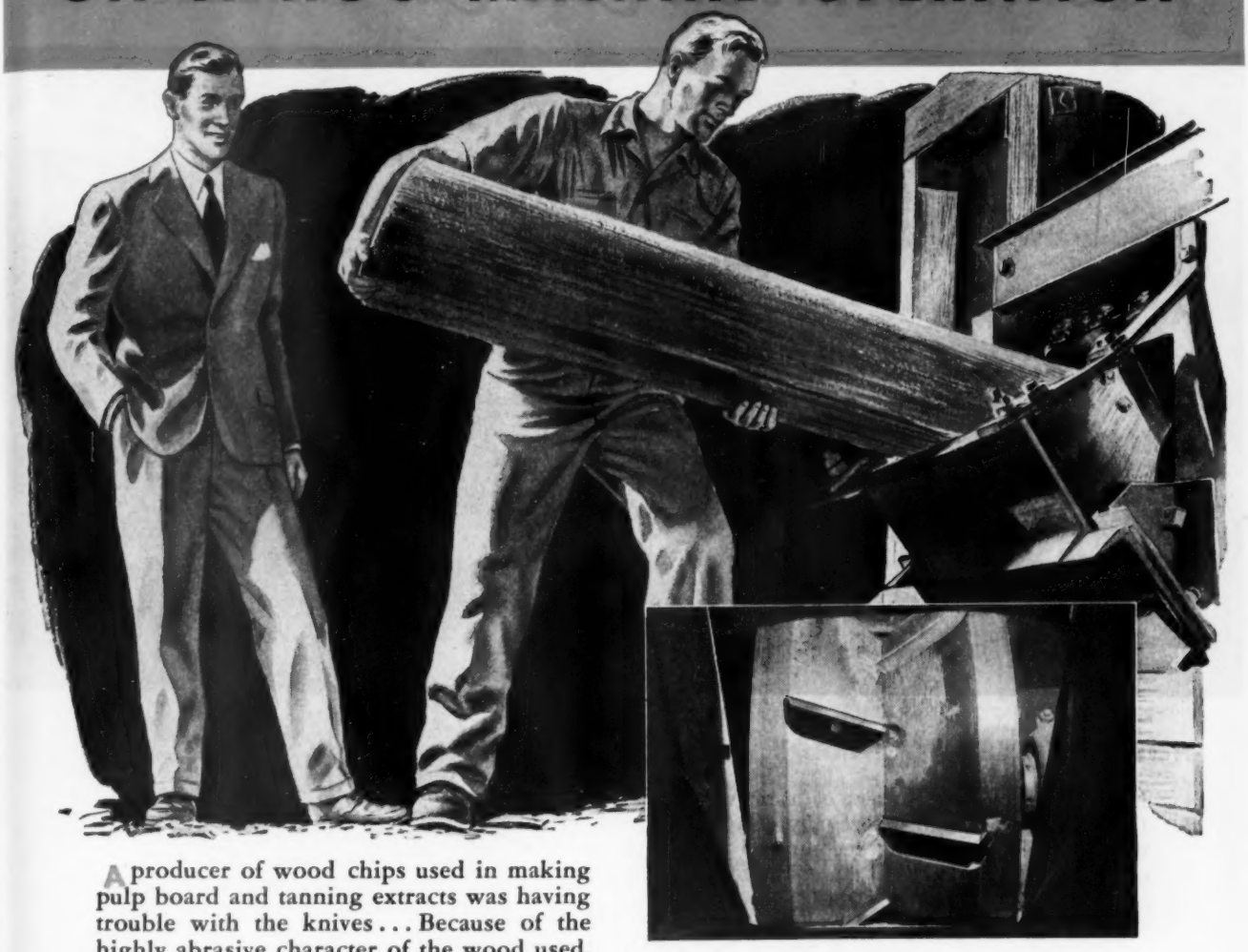
CARBORUNDUM

TRADE MARK

FOR EVERY ABRASIVE APPLICATION

("CARBORUNDUM" is a registered trade mark of and indicates manufacture by The Carborundum Company)

HOW A DISSTONEER CUT COSTS ON A HOG MACHINE OPERATION



A producer of wood chips used in making pulp board and tanning extracts was having trouble with the knives... Because of the highly abrasive character of the wood used, his carbon steel knives required sharpening every two hours, an operation which took 45 minutes each time.

The Disstoneer* called in to help solve the problem recommended the use of Disston Super-Safe Hog Knives. Resharpening was reduced from once every two hours to once every ten hours. There was also a marked reduction of undesirable wood dust or fines; wear on stones was reduced, thus fewer stones were needed; production was considerably increased and, at a lower cost per cord of wood chipped.

Interior view of hog machine showing Disston Super-Safe Knives bolted in position.

Another clear-cut case of Disston leadership

*DISSTONEER—a man who combines the experience of Disston leadership and sound engineering knowledge, to find the *right tool* for you—to cut wood, to cut metal and other materials—and TO CUT YOUR COST OF PRODUCTION—*not only on special work, but on ordinary jobs as well.*

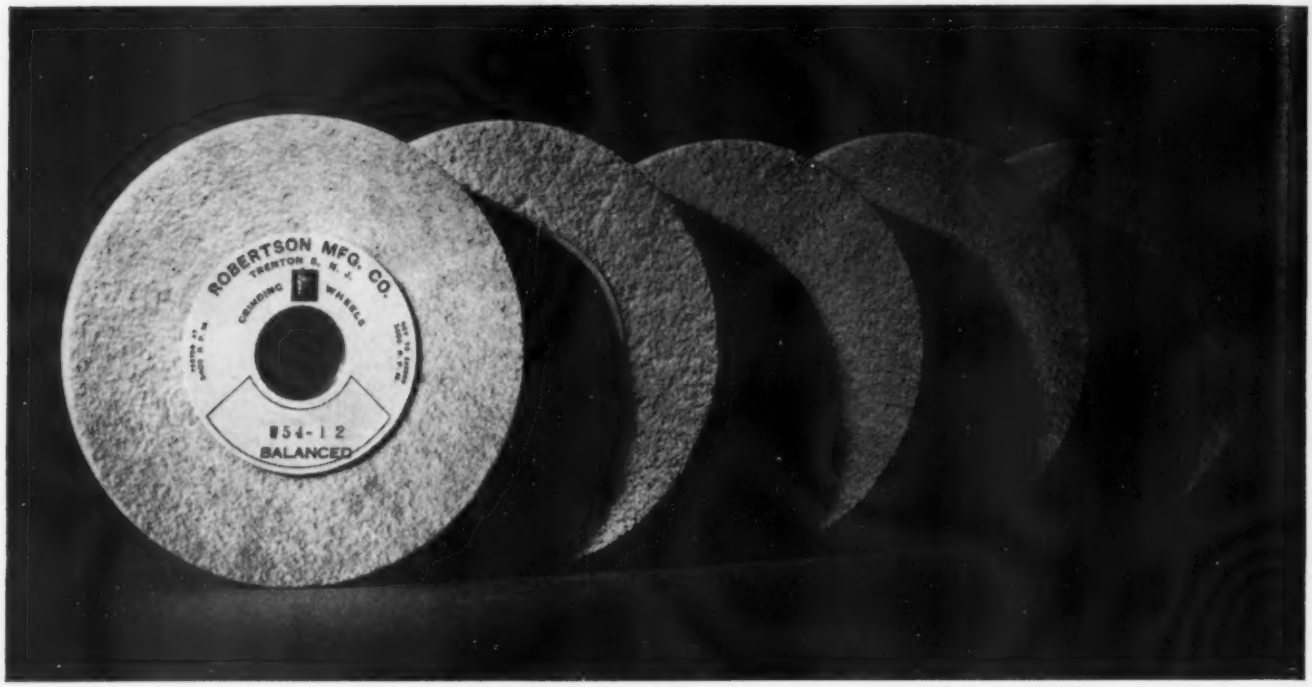
You may have no need for Knives of this character, but nearly every industry can speed up work and cut costs with

DISSTON HACK SAW BLADES FOR MACHINE USE

There are Disston machine hack saw blades for every Hack Saw Machine. Supplied in two types of steel: Disston High Speed Steel Blades for cutting stainless steel, chrome-nickel steels and similar alloys and Disston Di-Mol Blades (molybdenum and tungsten alloy) for cutting tool steels, machine steels, cast iron, tubing and for general machine shop production. Write for further particulars.

HENRY DISSTON & SONS, INC., 1120 Tacony, Philadelphia 35, Pa., U. S. A.

IMPARTIAL TEST* PROVES SUPERIORITY OF ROBERTSON *Cool-Cut* WHEELS



HOW THE TEST WAS MADE

Five leading manufacturers of abrasive wheels were requested by the United States Testing Company, Inc., to furnish grain and grade of wheel which they would recommend for doing the most efficient job of grinding hardened steel under the following specifications:

Steel—Ludlum Oil Hardening Steel, Rockwell Hardness 58 to 60
Grinder—No. 2 Brown & Sharpe Surface Grinder
Table Speed of Grinder—33 feet per minute
Depth of Cut—.015 inches
Cross Feed of Cut—.020 inches
Size of Wheel—7″ x ½″ x 1¼″

Each wheel was dressed on the Grinder and then passed over the work four times without any further dressing.

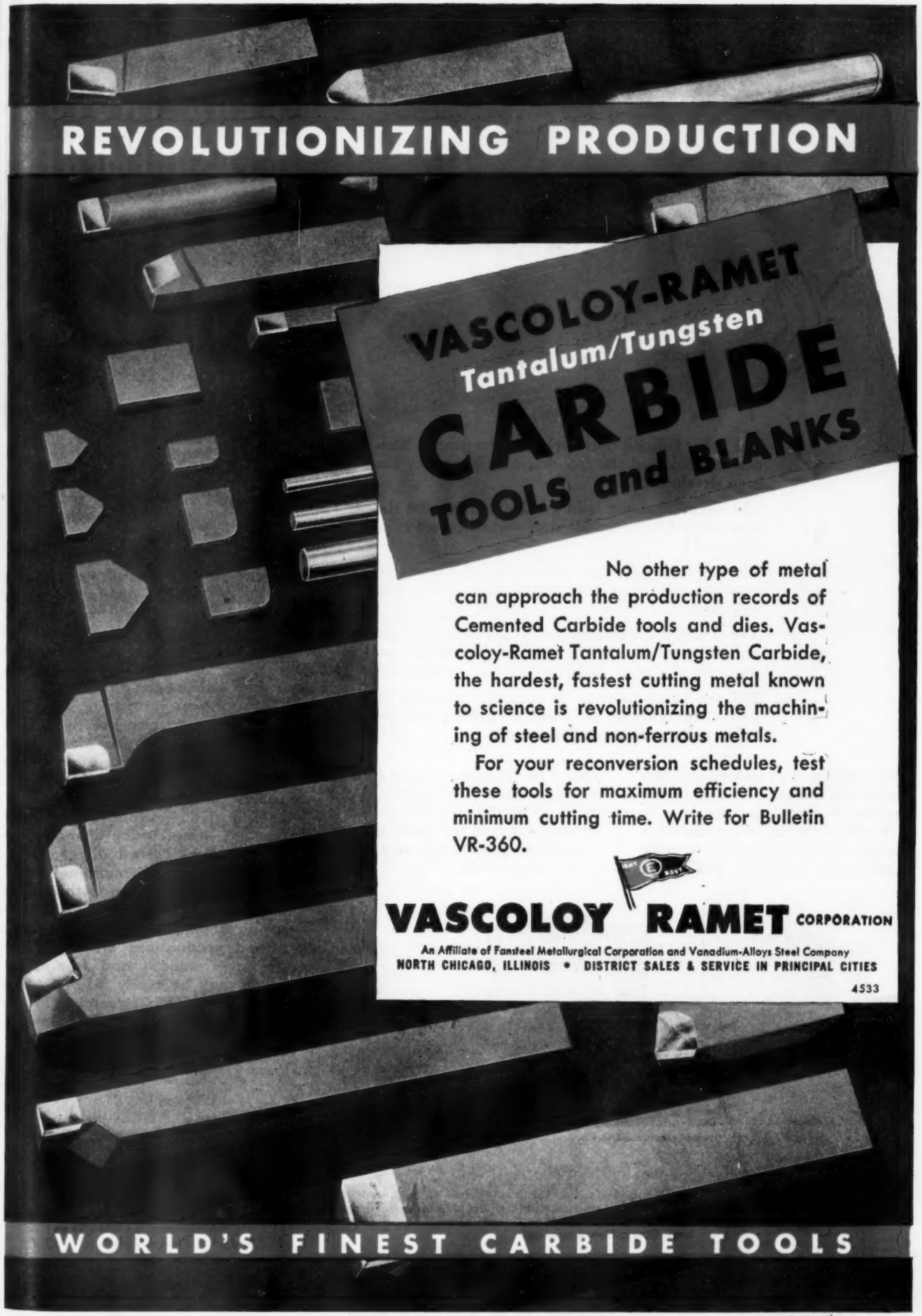
In its report of this test, the United States Testing Company, Inc., makes the following conclusion: "The result of our tests on the five abrasive wheels has shown conclusively that wheel "E," manufactured by the Robertson Manufacturing Company, and marked W 54 I 2, produced a ground piece of hardened steel of smoother finish, more accurately held to size, and with less effort."

In view of the conclusions of this impartial test, made by a nationally-known testing laboratory, you will want to know more about Robertson Cool-Cut wheels. Write for the free booklet, "How to Buy Production-Time," which tells all about Robertson Cool-Cut wheels.

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Manufacturers of Vitrified Bonded Grinding Wheels, Mounted Wheels, Segments

* Test No. 57347, August 3, 1945

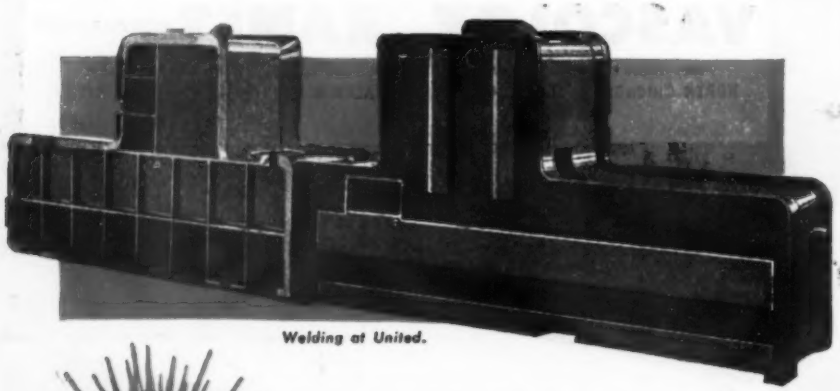

REVOLUTIONIZING PRODUCTION
VASCOLOY-RAMET
Tantalum/Tungsten
CARBIDE
TOOLS and BLANKS
No other type of metal can approach the production records of Cemented Carbide tools and dies. Vascoloy-Ramet Tantalum/Tungsten Carbide, the hardest, fastest cutting metal known to science is revolutionizing the machining of steel and non-ferrous metals.
For your reconversion schedules, test these tools for maximum efficiency and minimum cutting time. Write for Bulletin VR-360.
VASCOLOY RAMET CORPORATION
An Affiliate of Fansteel Metallurgical Corporation and Vanadium-Alloys Steel Company
NORTH CHICAGO, ILLINOIS • DISTRICT SALES & SERVICE IN PRINCIPAL CITIES
4533
WORLD'S FINEST CARBIDE TOOLS

IS YOUR SALES MANAGER UNHAPPY?

- ✓ The Front Office is optimistic over the general business outlook and the fact that a new product has been developed.
- ✓ The Chief Engineer is in good spirits because the new product embodies his ideas—was accepted as he designed it.
- ✓ The Purchasing Agent is relieved to find all material contracts advantageously placed as to prices and deliveries.
- ✓ The Factory Superintendent is pleased with the finished product, although the machining of castings ran the shop costs higher than anticipated.
- ✓ ***BUT the Sales Manager is unhappy because he cannot compete on price and is running into unexpectedly stiff sales resistance.***

That's not hard to understand. Mr. Superintendent put his finger on the trouble—higher shop costs.

Welded fabrication usually saves enough machining expense to make a substantial saving in production cost. The difference may be enough to overcome a price handicap, besides giving the sales advantages of greater strength and predictability, lighter weight, improved appearance, longer wear.



Welding at United.

United Engineering and Facilities—United Welding, established in 1913, has the experience and facilities to handle a full range of welded fabrications. Consult United engineers on design problems. Obtain United estimates.

WELDING ENGINEERS · UW CO · MIDDLETOWN, OHIO

THE UNITED WELDING CO.
MIDDLETOWN, OHIO

WELDING FABRICATORS OF MODERN DESIGNS

READ INSIDE MEASUREMENTS *HERE!*

No adding or subtracting

There's no fumbling on inside measuring when the MASTER "Streamline" is on the job. Secure measurement by locking tape . . . read dimension direct . . . no adding or subtracting required. You can also use this handy pocket rule for many other "special" measuring jobs such as calipering rounds, height gauging, scribing, etc. Its extra long "claw" and positive tape lock speeds operation . . . its accuracy of more than .005" insures correct dimensioning.

The MASTER "Streamline" is all steel in construction with chrome plated case and blade of finest spring steel that has permanently etched graduations on both sides. Action is smooth and free. Spare blade may be easily inserted. Send for your MASTER "Streamline" today . . . just clip the coupon below.

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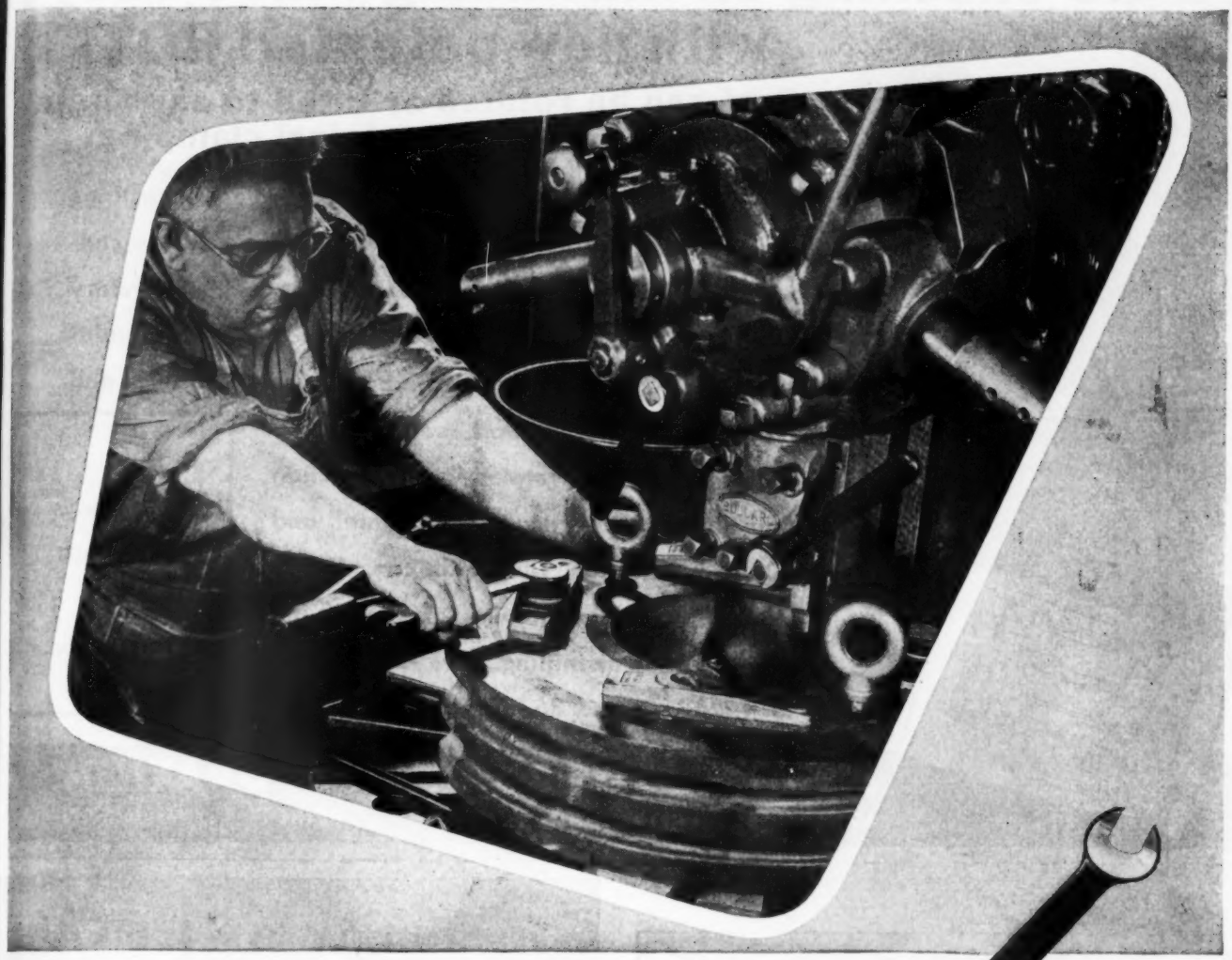

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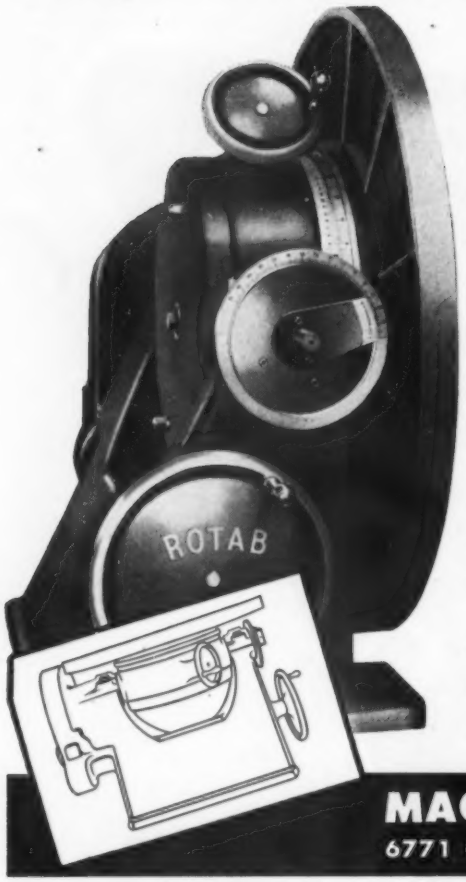
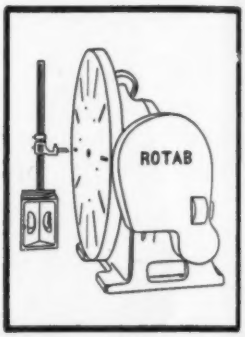
Angle checking on machining made easy with new patented ROTAB



Part can be rotated or tilted to any angle without changing original clamping.

Simplify the checking and measuring of angles on castings or parts with the new improved Rotab. A vernier is conveniently located directly underneath the table for rotary motions, and another opposite the gear control for angular settings. Perfect synchronization between controls and readings is assured. Part is clamped on table which can be rotated in any direction and tilted from vertical to horizontal, and 30° back direction. The Rotab can also be used as a holding fixture for simplifying angle boring or milling. Available in 12-inch, 24-inch and 36-inch sized faceplate.



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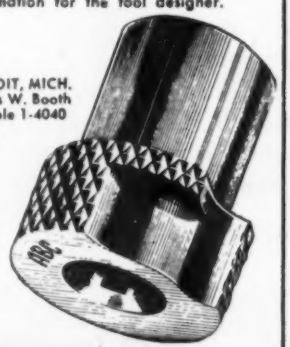

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ILLINOIS DIE FILING MACHINE

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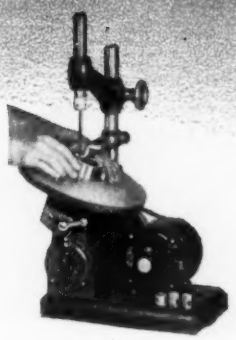
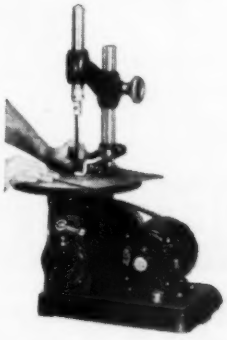
Designed for filing of intricate die shapes...table can be tilted to right or left up to 20° from horizontal. Hand files can be used.



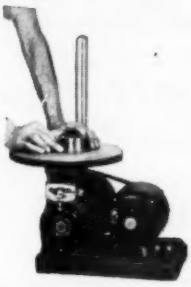
2 - SAWING

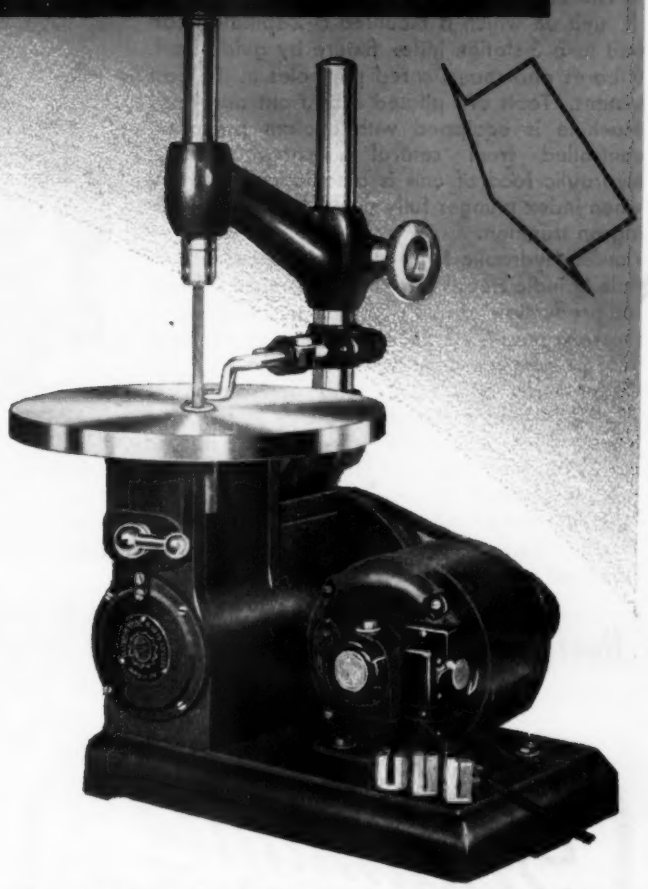
The table has a removable ring insert so that shank sizes of saws and files up to 6" length can be accommodated. Saw guide may be utilized as a hold-down finger.



3 - STONING

A finishing stone can be installed easily and quickly—which emphasizes the utility of this versatile machine that performs three major production steps: filing, sawing and stoning.





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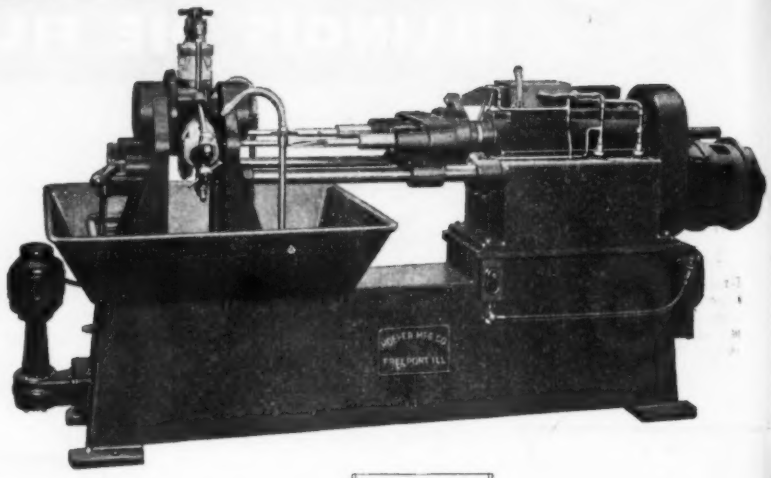

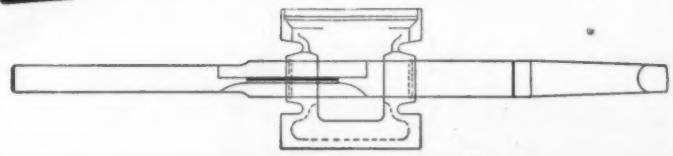

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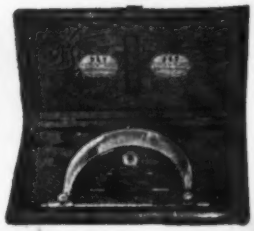

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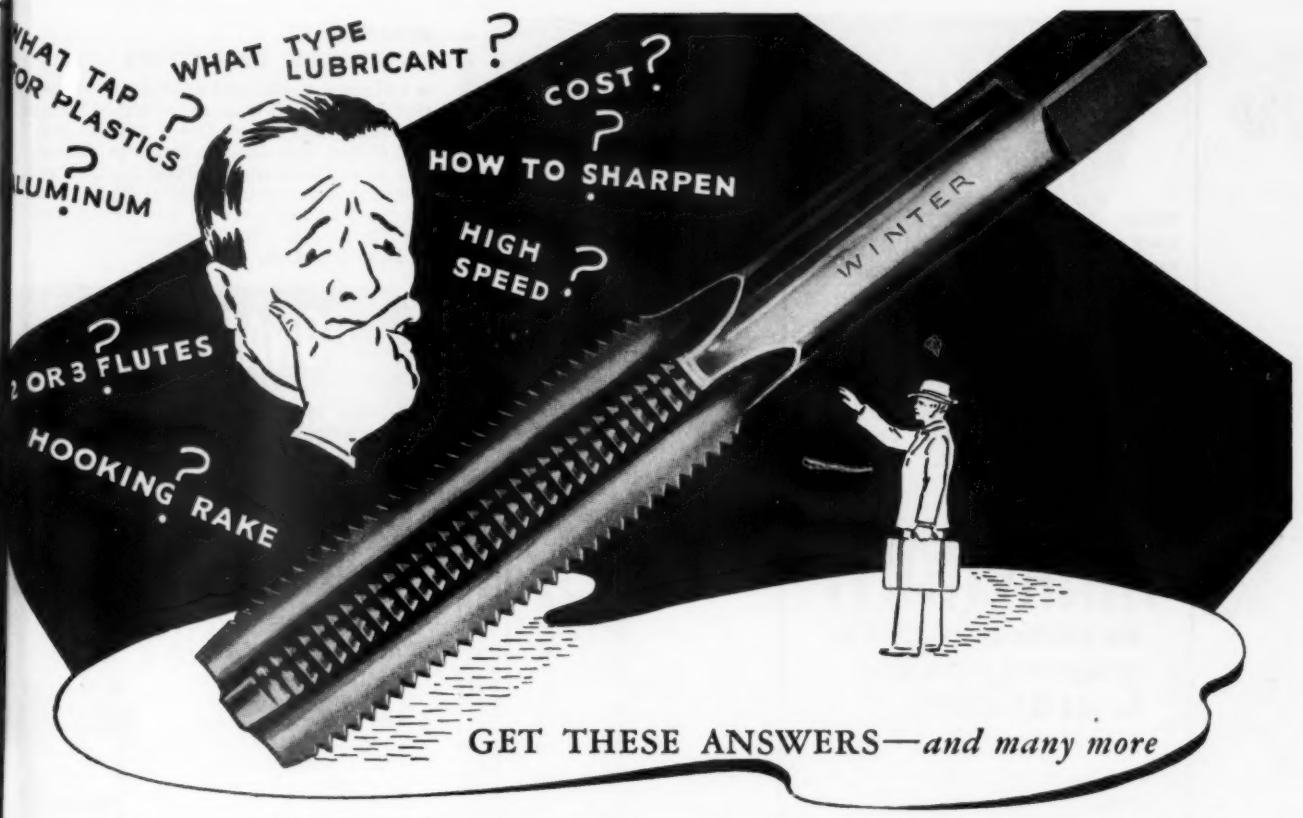

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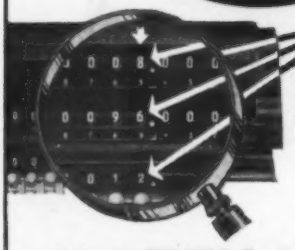

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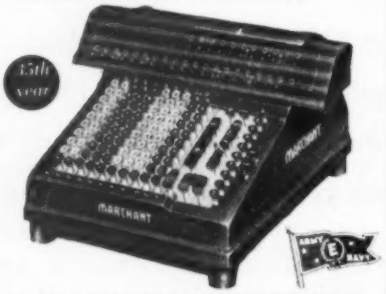

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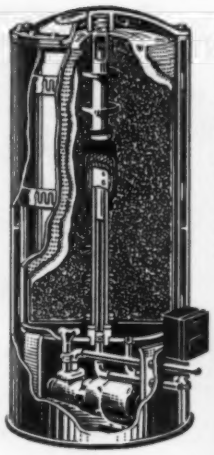

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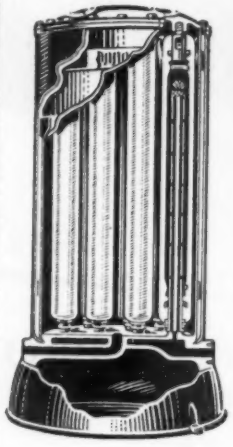

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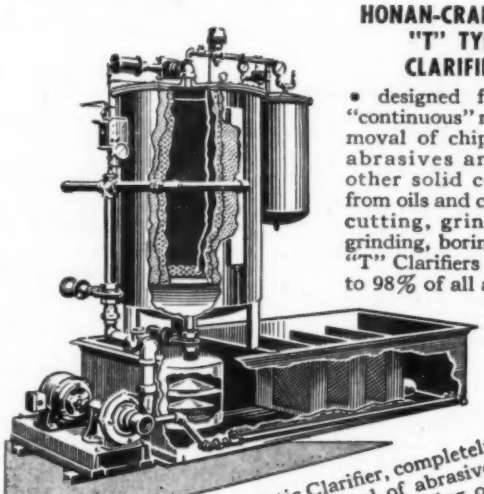

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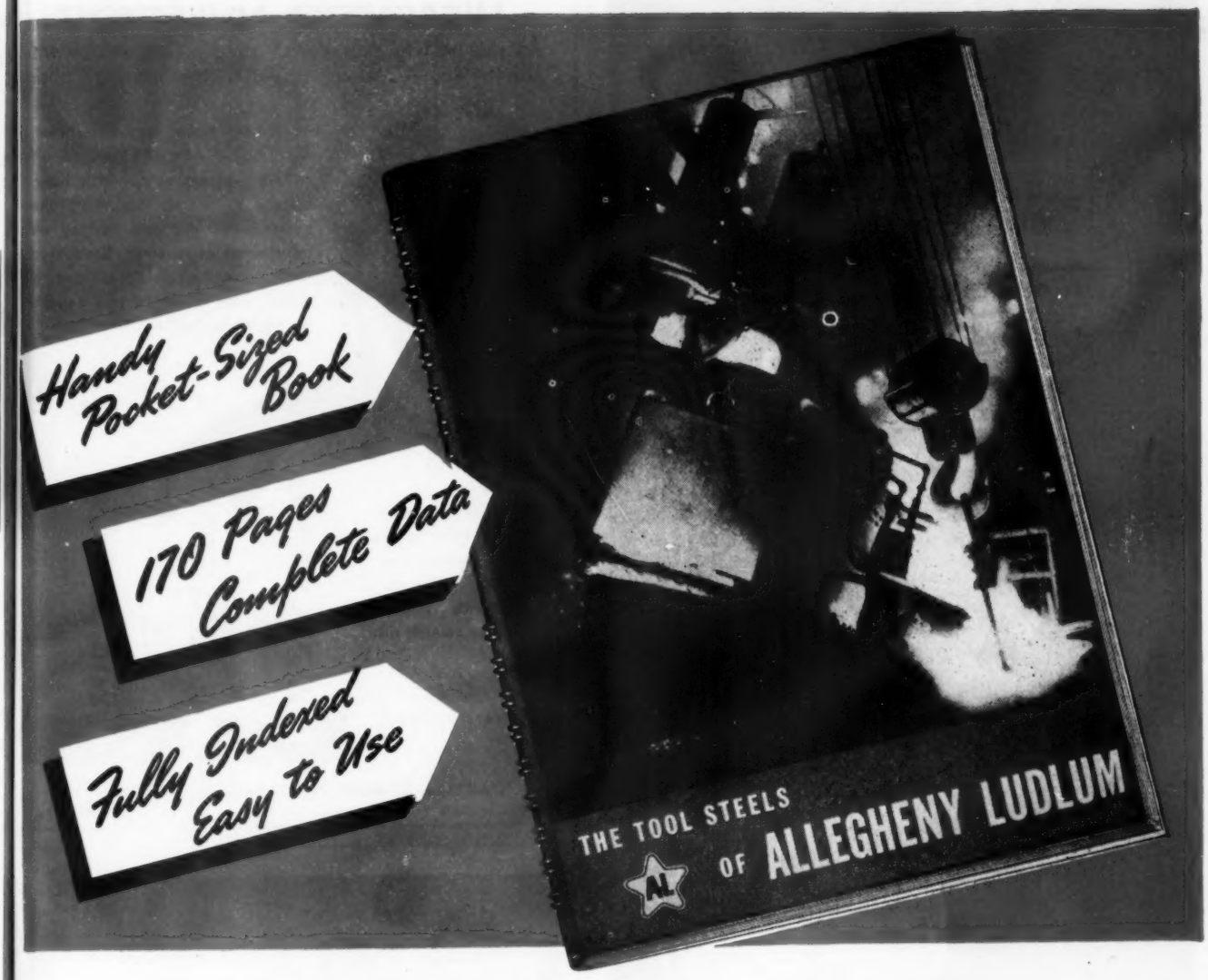

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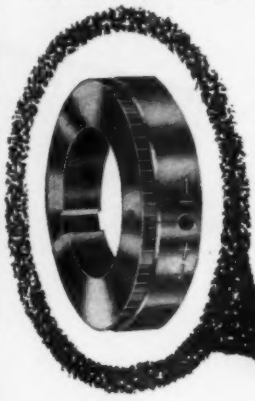

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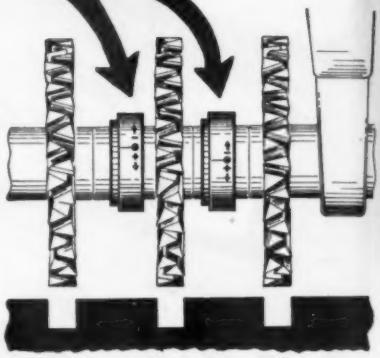

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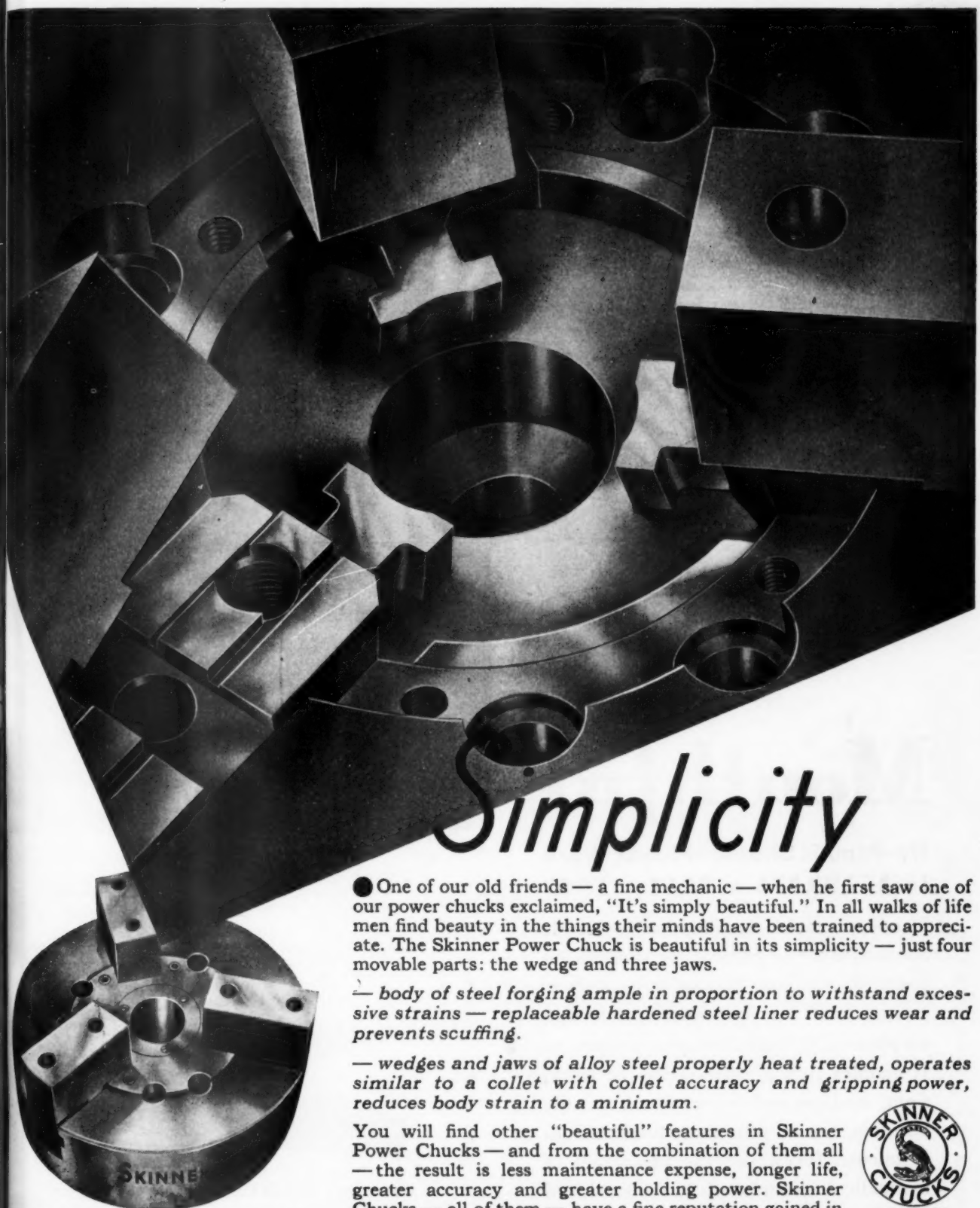


Simplicity

● One of our old friends — a fine mechanic — when he first saw one of our power chucks exclaimed, "It's simply beautiful." In all walks of life men find beauty in the things their minds have been trained to appreciate. The Skinner Power Chuck is beautiful in its simplicity — just four movable parts: the wedge and three jaws.

— body of steel forging ample in proportion to withstand excessive strains — replaceable hardened steel liner reduces wear and prevents scuffing.

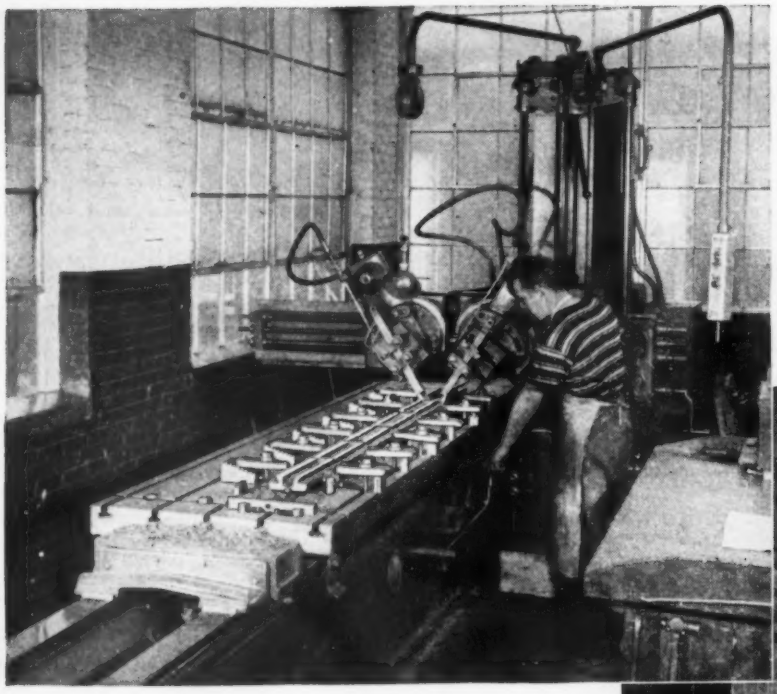
— wedges and jaws of alloy steel properly heat treated, operates similar to a collet with collet accuracy and gripping power, reduces body strain to a minimum.

You will find other "beautiful" features in Skinner Power Chucks — and from the combination of them all — the result is less maintenance expense, longer life, greater accuracy and greater holding power. Skinner Chucks — all of them — have a fine reputation gained in nearly 60 years of "know how" and craftsmanship.

SKINNER CHUCKS
THE CREST OF QUALITY

THE SKINNER CHUCK CO.
345 CHURCH STREET
NEW BRITAIN, CONN., U. S. A.

SKINNER chucks



Hy-Draulic

4518

Light Bite

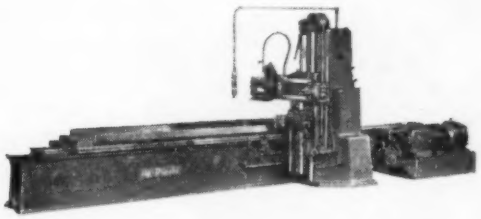
or a

Mouthful

Hy-Draulic Shaper-Planer Work Is ACCURATE • FAST • EASY

Handy, powerful, durable, the Hy-Draulic Shaper-Planer is particularly effective on pieces that are too big for large shapers yet too small for economical production on planers. Accurate, fast, easy to operate. It handles such a wide variety of work, light, medium and heavy, that it quickly becomes one of your most profitable investments. Investigate the advantages of hydraulic drive and feeds in the Rockford Hy-Draulic Shaper-Planer. Write, today, for Bulletin 1129.

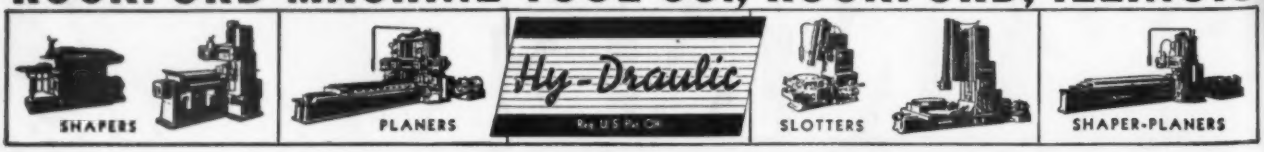
- Above, left .... A 120" stroke Hy-Draulic Shaper-Planer, planing dovetails on cast-iron slides. Extra crossrail head reduces planing time.
- Above, right .... Same Shaper-Planer roughing a gang of cast steel steering gear parts. Note crossrail head and side head are both working on intermittent cuts.



ROCKFORD HY-DRAULIC SHAPER-PLANERS

Available in stroke-lengths of 42", 66", 90", 120" and 144". Hy-Draulic Shaper-Planer speeds and feeds are infinitely adjustable in specified ranges. Economical standard constant speed electric motor drives hydraulic unit.

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



GEORGE ELLIS QUOTES A CUSTOMER:

"...Shankless* out-performs...by 3 to 1"...

"The SHANKLESS drill out-performs every conventional drill we have tested by 3 to 1"

That's what one of our customers said about SHANKLESS Roll-Forged Drills. It's typical of what they all say. Some are attracted by the 20% to 25% lower price—some by the better performance. But they almost always end up by standardizing on SHANKLESS.

George E. Ellis

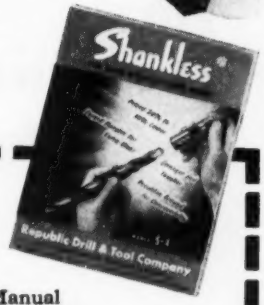
REPUBLIC Service Engineer

If you use twist drills, it will pay you to get the *complete* story of SHANKLESS Roll-Forged Drills. It's in our Manual S-4, which we will gladly send you on request.

Republic

ALSO MAKES OVER 100 DIFFERENT TYPES OF CONVENTIONAL HIGH SPEED AND CARBON STEEL DRILLS

*Registered at U.S. Patent Office



Republic Drill & Tool Co., AM-11
322 South Green Street
Chicago 7, Illinois

Please send me a copy of your new Manual which gives the complete story of Republic's "Shankless" drills.

Name.....

Address.....

City.....*Zone*....*State*.....

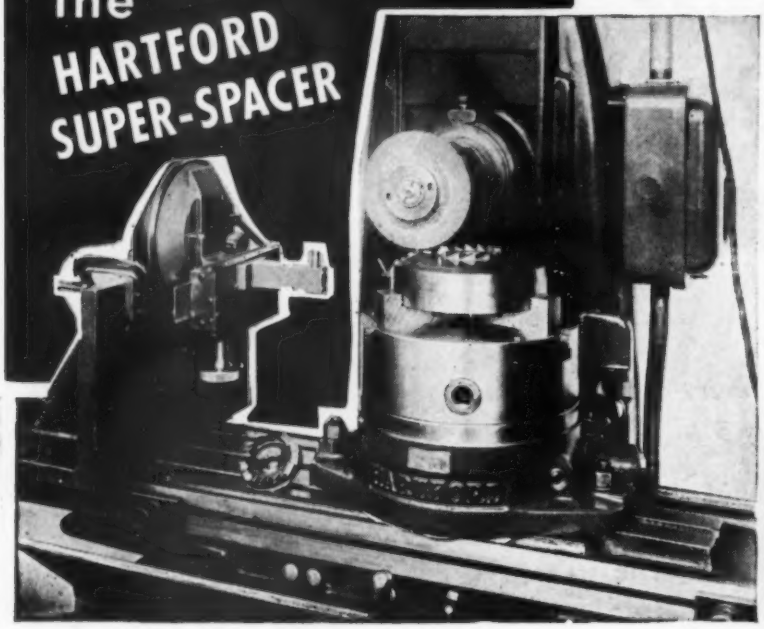
Republic DRILL & TOOL COMPANY

CHICAGO 7, ILLINOIS

BOSTON • NEW YORK • PHILADELPHIA • PITTSBURGH • CLEVELAND • DETROIT • DAYTON • BIRMINGHAM • LOS ANGELES • SAN FRANCISCO

WORLD'S LARGEST EXCLUSIVE MANUFACTURER OF TWIST DRILLS

DUST and DIRT cannot affect the accuracy and performance of the HARTFORD SUPER-SPACER



PROTECTIVE sealing of the Hartford Super-Spacer against dry-ground dust makes its use safe and accurate in grinding operations such as the one shown here.

Mounted in a vertical position, with work securely held in the chuck of the Super-Spacer, the operation consists in grinding the hardened clutching surfaces of an airplane clutch to close radial tolerance. Indexing is fast and precise, mask plates assuring a foolproof means of removing all possibility of error.

In the era ahead, when precision production under high production schedules will be demanded, the Super-Spacer can be a tool of outstanding value. It has already proved itself a practical means of maintaining rigid control of accurate indexing operations and experience has demonstrated its extreme utility. The fact that new work will be involved in tomorrow's production is all the more reason to investigate the almost unlimited possibilities of the Hartford Super-Spacer on your work.

●

Write at once for illustrated literature showing some of the many applications of this, time-saving, cost-cutting spacing device.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.
Makers of the famous Hartford Super-Spacer

GREEN FULL-FLOATING REAMER HOLDER FOR AUTOMATIC SCREW MACHINES

SUCCESSFUL new float action, based on synthetic rubber, and employing no balls, rollers, springs, friction devices, or similar moving parts, gives a free but controllable aligning movement on the reamer so that it *will not cramp or cause bell-mouth.* A simple adjustment centers the reamer and eliminates hang. Green Reamer Holders are fast gaining wide and enthusiastic acceptance on all popular makes of machines. They are the answer to your reaming troubles!

Write for Descriptive Bulletin

GREEN MANUFACTURING CO.
650 S. WYMAN ST., ROCKFORD, ILLINOIS

Investigate THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, taper holes, and offset holes. We also manufacture oil-grooving millers.

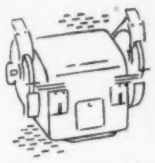
WRITE today for Catalog No. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

HERE'S Complete GRINDING WHEEL SERVICE

ALONG with speed, perfection and economy in grinding with SAFETY Grinding Wheels, you get a complete and highly developed service that goes far beyond superior grinding wheel performance.

FIRST, there's a SAFETY Whee specifically designed for every job, regardless of how unusual or difficult that job may be . . . your needs are anticipated and provided for long before they occur.

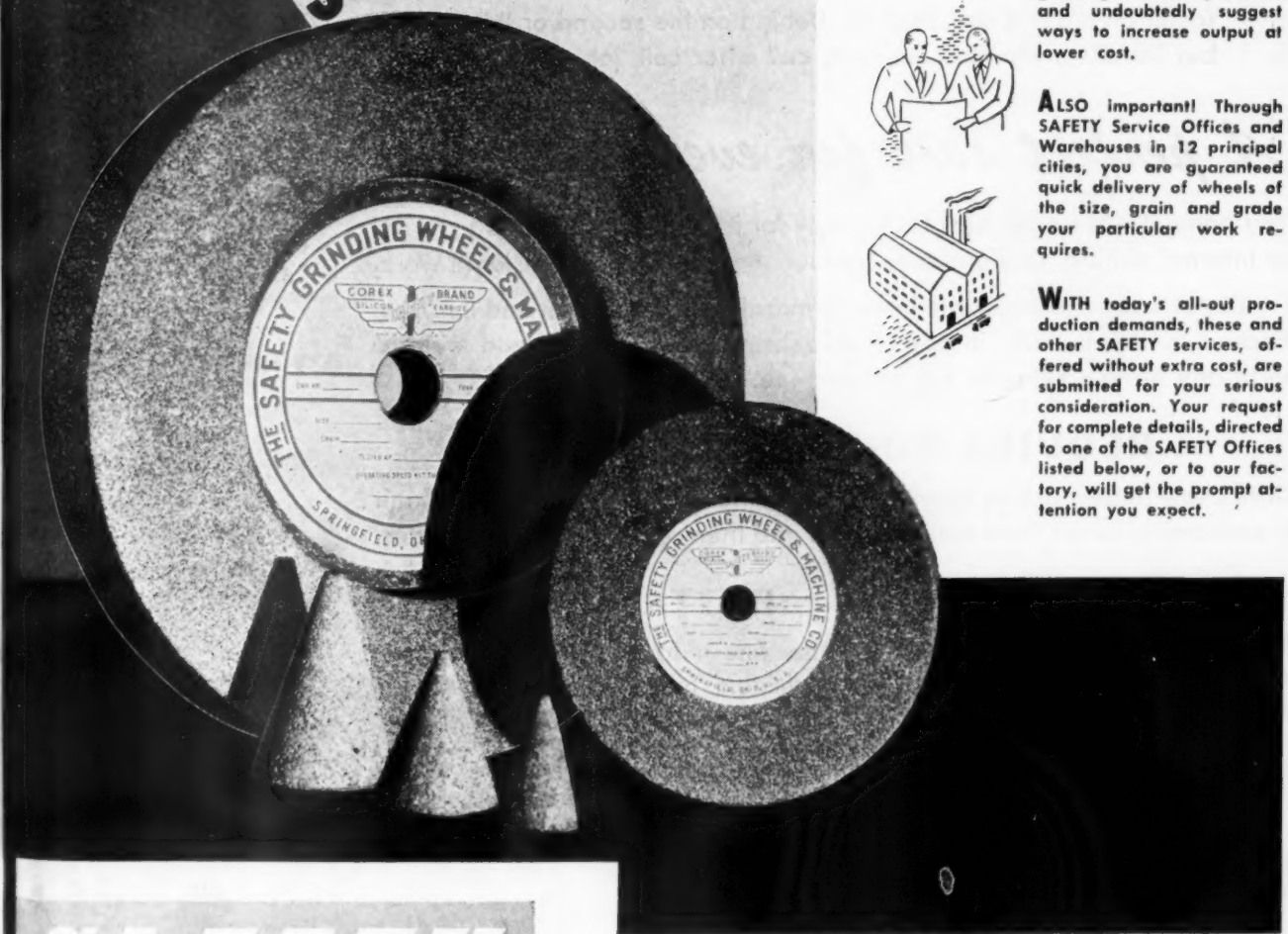


THEN, SAFETY Grinding Machines provide short cuts to better grinding—Rite-Speed Grinders, Swing Frame Grinders, Floor Stand Grinders, to mention a few—all now doing an outstanding job in machine shops everywhere.

NEXT, you are offered the counsel and advice of abrasive wheel engineers and specialists who will, if you wish, analyse your grinding wheel problems and undoubtedly suggest ways to increase output at lower cost.

ALSO important! Through SAFETY Service Offices and Warehouses in 12 principal cities, you are guaranteed quick delivery of wheels of the size, grain and grade your particular work requires.

WITH today's all-out production demands, these and other SAFETY services, offered without extra cost, are submitted for your serious consideration. Your request for complete details, directed to one of the SAFETY Offices listed below, or to our factory, will get the prompt attention you expect.



Write for SAFETY'S new book on Grinding Wheels. Just off the Press. No obligation.

SAFETY

GRINDING WHEEL AND MACHINE COMPANY

Main Office and Factory SPRINGFIELD, OHIO, Phone 4651

● Birmingham—3-3323 ★ Chicago—TRiangle 8308 ★ Cleveland—MAIN 6479-80 ★ Detroit—TOwnsend 3-4740
★ Pittsburgh—ATlantic 5218 ★ Erie—23-093 ★ Philadelphia—WAlnut 3132 ★ St. Louis—CEntral 3676
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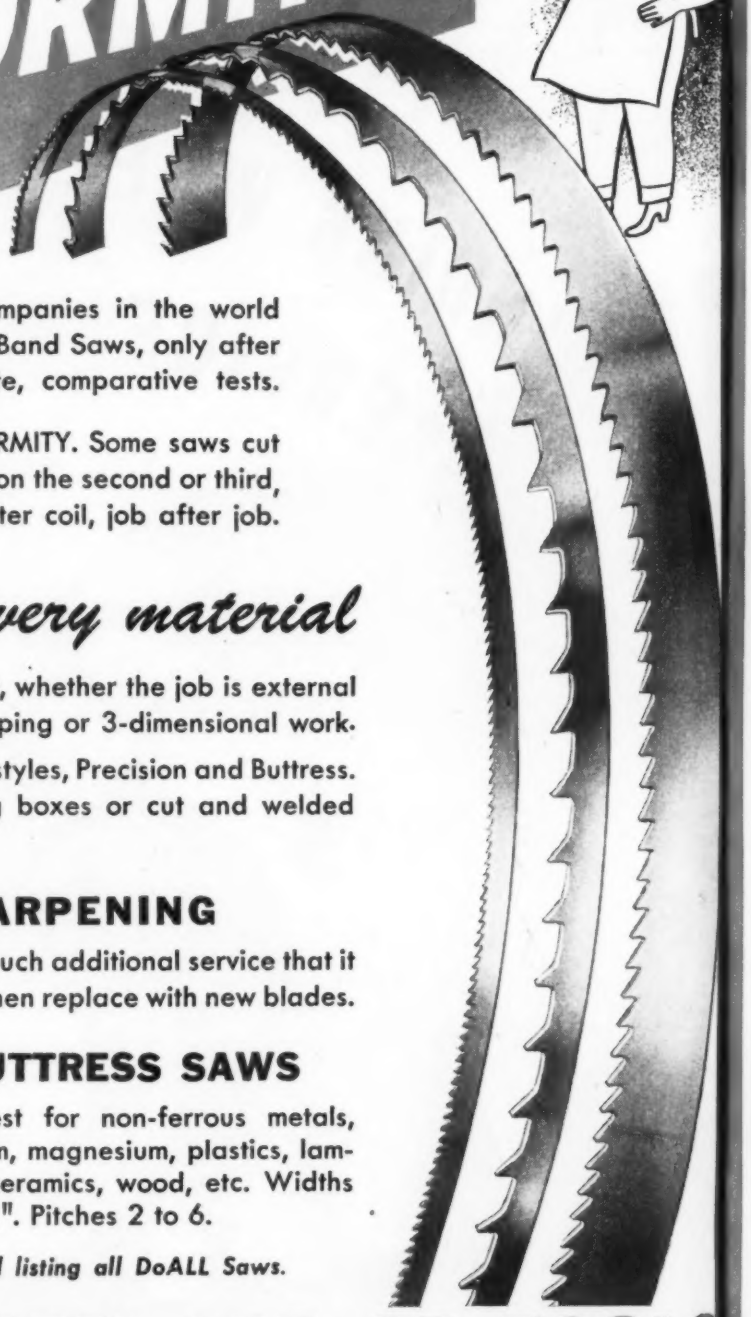
● *Sales Offices and* ★ *Sales Offices and Warehouses for Better Service!*

WINS ON UNIFORMITY



Recently one of the largest steel companies in the world (name on request) switched to DoALL Band Saws, only after making 29 very minute and concrete, comparative tests.

DoALL won on the basis of UNIFORMITY. Some saws cut faster on the first coil, then fell behind on the second or third, but DoALLs were most uniform, coil after coil, job after job.

A perfect saw for every material

You name it—there's a best DoALL saw for it, whether the job is external or internal cutting, straight line, contour shaping or 3-dimensional work.

DoALL Saws are available in two general styles, Precision and Buttress. Packed in 100-ft. coils in safety dispensing boxes or cut and welded to fit any band sawing or cut-off machine.

REQUIRE NO RESHARPENING

DoALL saw blades are so tough and give so much additional service that it is economical to run them until worn out and then replace with new blades.

PRECISION SAWS

Recommended for use on all ferrous metals. Come in widths from 3/32" to 1", pitches 6 to 32.

BUTTRESS SAWS

The finest for non-ferrous metals, aluminum, magnesium, plastics, laminates, ceramics, wood, etc. Widths 1/4" to 1". Pitches 2 to 6.

Write or phone for booklet illustrating and listing all DoALL Saws.

INDUSTRY'S NEW SET OF TOOLS

Contour Sawing · Band Filer · Surface Grinders · Magnetic Chucks and Selectron · Colloidal Oils · Dust Collector · Band Saws · Band Files · Gage Blocks with Instruments

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Buffalo	PA 6666	El Paso	MAIN 7046					Rockford	MAIN 227	Toledo	GA 9389
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LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

Get these two essentials of cost-saving lubrication

1. The right lubricant

2. In the right places

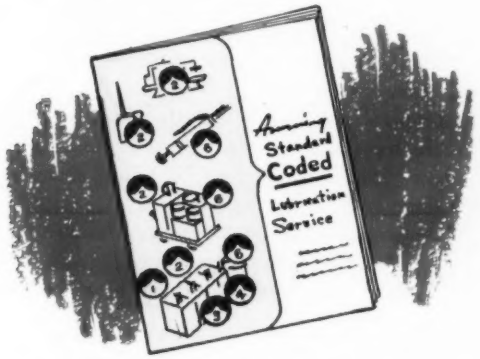
TWO HELPFUL SERVICES are offered by Standard Oil to manufacturers in the Middle West. They are designed to take "guess work" out of plant lubrication and to eliminate costly and wasteful repairs resulting from the use of incorrect lubricants.

SO 1 CO CODED SO 2 CO LUBRICATION

Lubrication Engineering Service

Standard Oil has experienced Lubrication Engineers located in principal cities throughout the midwestern states shown on the map.

These Engineers have two advantages when analyzing your lubrication needs. They are familiar with the operation of all types of plant equipment—as are your plant personnel—and they have a complete knowledge of the lubricants available to meet your requirements. Thus Standard Oil Lubrication Engineers can help you *get the right lubricant.*



Standard Coded Lubrication Service

In addition, these Engineers can supply you with a simple Coded System for applying lubricants. Briefly, the system provides for numbering all lubricants used in your plant. Every drum, oil can or grease gun used for dispensing lubricants is identified by a number to indicate the lubricant it contains. Each spot to be lubricated is also marked by a number to indicate the lubricants required.

The booklet illustrated fully describes this system. If your plant is located in the Middle West, a Lubrication Engineer will be glad to call and explain how Coded Lubrication can be applied in your plant or perhaps combined with your present system.

Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for a copy of the booklet or for the Engineer nearest you.

Buy more War Bonds

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . .

To help you avoid deposits in compressors

CONDITIONS under which compressors operate, particularly under today's heavy loads, tend to cause excessive deposits.

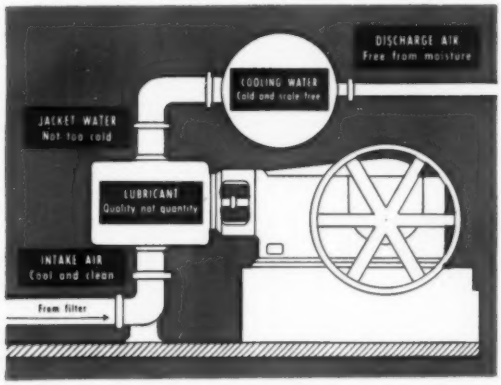
Improper lubrication is not always responsible for these deposits, but a compressor lubricant with the right qualities can reduce or eliminate many of them. Stanoil is such a lubricant.

The causes of some of the more common compressor operating problems and suggested cures, as well as the advantages of Stanoil, are listed on this page.

A Standard Oil Lubrication Engineer will be glad to help you apply the right grade of Stanoil to overcome excessive deposits and wear on your compressors. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, for the Engineer nearest you.

STANOIL

Buy more War Bonds



Causes and Cures

Valve Deposits—Oxygen in the air and heat generated by compression tend to oxidize conventional oils, causing the formation of carbon and asphaltic substances which deposit on valves.

To avoid oil oxidation, keep intake air temperatures as low as possible. Be sure inter-coolers and after-coolers are supplied with an ample supply of cool water, and keep them free from scale and rust. Use Stanoil, from which the unstable hydrocarbons—those affected by heat and oxygen—have been removed, thus eliminating many troublesome deposits at the source.

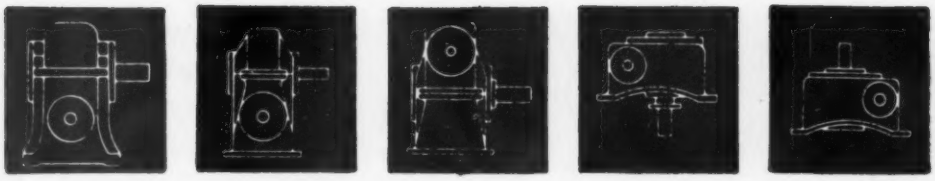
Dirty Intake Air. The enormous volume of air required by compressors may introduce a large quantity of dirt and dust which contributes both to excessive wear and deposits. Use efficient air screens and keep them clean. Be sure they are not located near a source of dirty air. Use Stanoil which resists the formation of gummy deposits that might collect dirt and dust and add to deposits on valves.

Condensation in Inter-Coolers. Water in the inter-cooler should be cold enough to condense oil and moisture in the compressed air so that they can be removed before entering the high pressure cylinders where they might cause excessive deposits.

Over-Lubrication. Oil is not burned up in compressors as it is in internal combustion engines, nor is it washed away as it is in steam engines. Oil remains in the compressor cylinder, and if it is of the right quality, very little is needed. An excessive amount of oil increases the possibility of deposits in valves, inter-coolers and air lines. Compressors usually require from 1/5 to 1/10 as much oil as steam cylinders of similar size. Because of the high lubricating quality of Stanoil, only a very small amount is needed to secure adequate lubrication.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

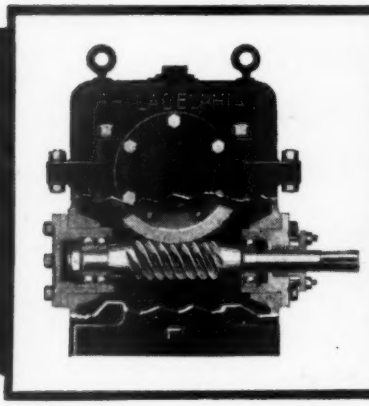


EVERY SIZE and TYPE

Worm Gear SPEED REDUCER

As a standard series, the Philadelphia Line of Worm Gear Reducers are not excelled in Design, Versatility of arrangement, and Fine Workmanship. Generally speaking, they are divided into 3 groups: Heavy Duty, Medium Duty, and Small Units (for all-around low and fractional horsepower service). As will be noted from the diagrams surrounding this advertisement, the worm shaft locations may be below the gear or above the gear; or the output shaft may extend upward or downward,—of course, Philadelphia Worm Reducers may also be had in Double Horizontal; Double Vertical Units;—Helical Gear attachments,—or in Motorized Worm Gear Units.

Finally, there is no type, size or combination of Worm Gear Speed Reducer that Philadelphia has not, or cannot make—and, they're all of the highest quality. Be convinced, send for *Worm Gear Catalog No. 25.*



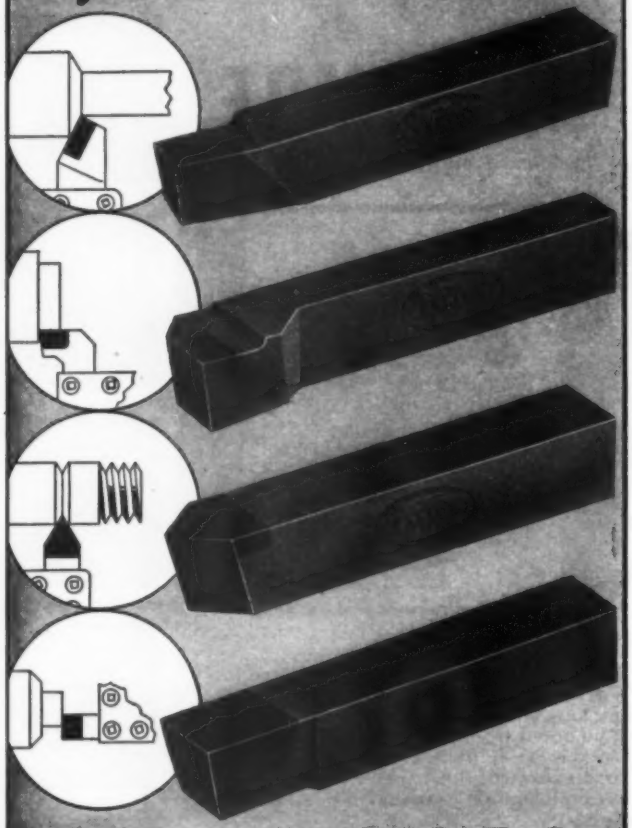
....for every Conceivable Industrial Application

Philadelphia GEAR WORKS INCORPORATED

ERIE AVE. AND G ST., PHILADELPHIA 34, PA. NEW YORK • PITTSBURGH • CHICAGO
IN CANADA: WILLIAM & J. G. GREEY LIMITED, TORONTO.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

TALIDE TOOLS *for* Higher Speed Production!



Talide-Tipped Tools are increasing the output of all kinds of machined parts because they cut faster, last longer and produce a better finish. The extra hardness, density and toughness of Talide Tips make their use universal for both heavy hogging and fine finishing work.

Reduce your cost of machining hard castings, steel forgings and other precision parts by using Talide-Tipped Tools to produce more pieces per grind—in less machine time. Available in both Tungsten Carbide and Tungsten-Titanium Carbide compositions, Talide-Tipped Tools give longer run, higher speed performances on all types of boring, facing and turning operations.

Send for Catalog 44-T listing Standard Tools and Tips.

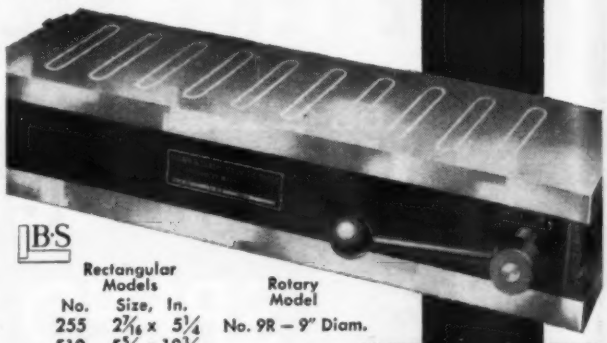
TIPPED WITH TALIDE TUNGSTEN CARBIDE

METAL CARBIDES CORPORATION YOUNGSTOWN, OHIO

METAL CARBIDES CORPORATION
YOUNGSTOWN, 5 OHIO
TUNGSTEN CARBIDE TOOLS · DIES · WEAR PARTS

NO WIRES
NO HEATING
NO OPERATING COSTS

Permanent Magnet Chucks are ready for instant use on any machine of suitable size and on work bench or surface plate. No auxiliary generators or electrical connections are needed. Catalog sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



B&S

Rectangular Models No.	Size, In.	Rotary Model
255	2 7/16 x 5 1/4	No. 9R — 9" Diam.
510	5 5/8 x 10 3/8	
618	6 3/8 x 18 1/8	
824	8 3/8 x 24 7/16	
1236	12 1/8 x 36	

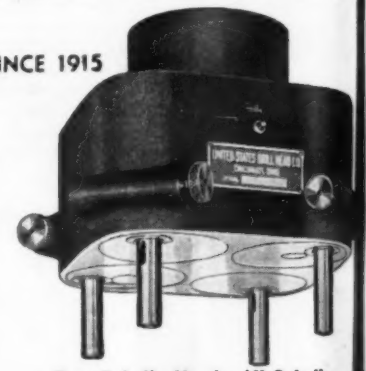
For sale only in the United States of America and its Territories and in Canada.

BROWN & SHARPE PERMANENT MAGNET CHUCKS

STANDARD US HEADS SINCE 1915

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS
UNITED STATES DRILL HEAD CO., CINCINNATI 4, OHIO

HARDNESS TESTER

Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
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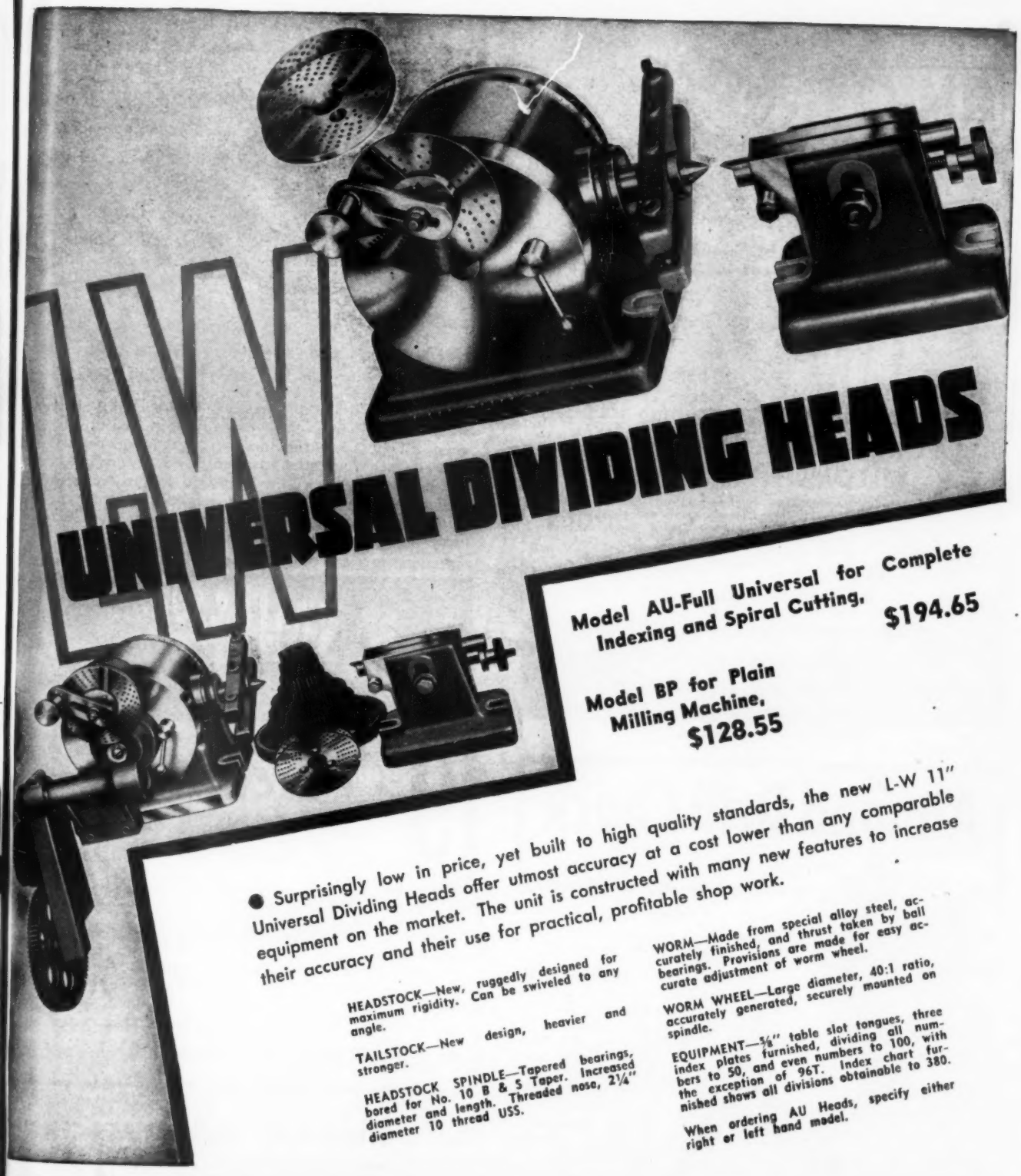
TELEPHONE: JAMAICA 6-4090



L-W UNIVERSAL DIVIDING HEADS

Model AU-Full Universal for Complete Indexing and Spiral Cutting, $194.65

Model BP for Plain Milling Machine, $128.55

● Surprisingly low in price, yet built to high quality standards, the new L-W 11" Universal Dividing Heads offer utmost accuracy at a cost lower than any comparable equipment on the market. The unit is constructed with many new features to increase their accuracy and their use for practical, profitable shop work.

HEADSTOCK—New, ruggedly designed for maximum rigidity. Can be swiveled to any angle.

TAILSTOCK—New design, heavier and stronger.

HEADSTOCK SPINDLE—Tapered bearings, bored for No. 10 B & S Taper. Increased diameter and length. Threaded nose, 2¼" diameter 10 thread USS.

WORM—Made from special alloy steel, accurately finished, and thrust taken by ball bearings. Provisions are made for easy accurate adjustment of worm wheel.

WORM WHEEL—Large diameter, 40:1 ratio, accurately generated, securely mounted on spindle.

EQUIPMENT—⅝" table slot tongues, three index plates furnished, dividing all numbers to 50, and even numbers to 100, with the exception of 96T. Index chart furnished shows all divisions obtainable to 380.

When ordering AU Heads, specify either right or left hand model.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 5 N. ST. CLAIR ST. TOLEDO 4, OHIO

AMIC

VERNIER CALIPERS

QUICK-ACTION CALIPER FOR USE IN WORKSHOP — INSPECTION AUTOMOTIVE REPAIR

Permits accurate measurements of external and internal dimensions. Knife-edged jaws accommodate thread measurements and a depth gage blade, depth measurements. Made in stainless steel or toolsteel. Each caliper packed in a leatherette cover.
AMIC PRECISION VERNIER CALIPERS: 6", 10", 24"
AMIC PRECISION VERNIER HEIGHT GAGES: 10", 18", 24"
DEPTH GAGES: POCKET CALIPERS

Ask for literature and prices

AMERICAN MEASURING INSTRUMENTS CORP.
240 WEST 40th ST. • NEW YORK 18, N. Y.

Cable address: AMICTOOL, N. Y.

Almond Drill Chuck

. . for over 70 years

ALMOND THREE-JAW DRILL CHUCKS—the first to be placed on the market more than seventy years ago—pioneered the field of drill chucks. During all these many years, ALMOND CHUCKS have continued to be a necessary part in the logical procedure of machine developments.

Made in types and sizes to fit all machine tools and portable drills.

Write for further information.

The Original Manufacturers of Drill Chucks

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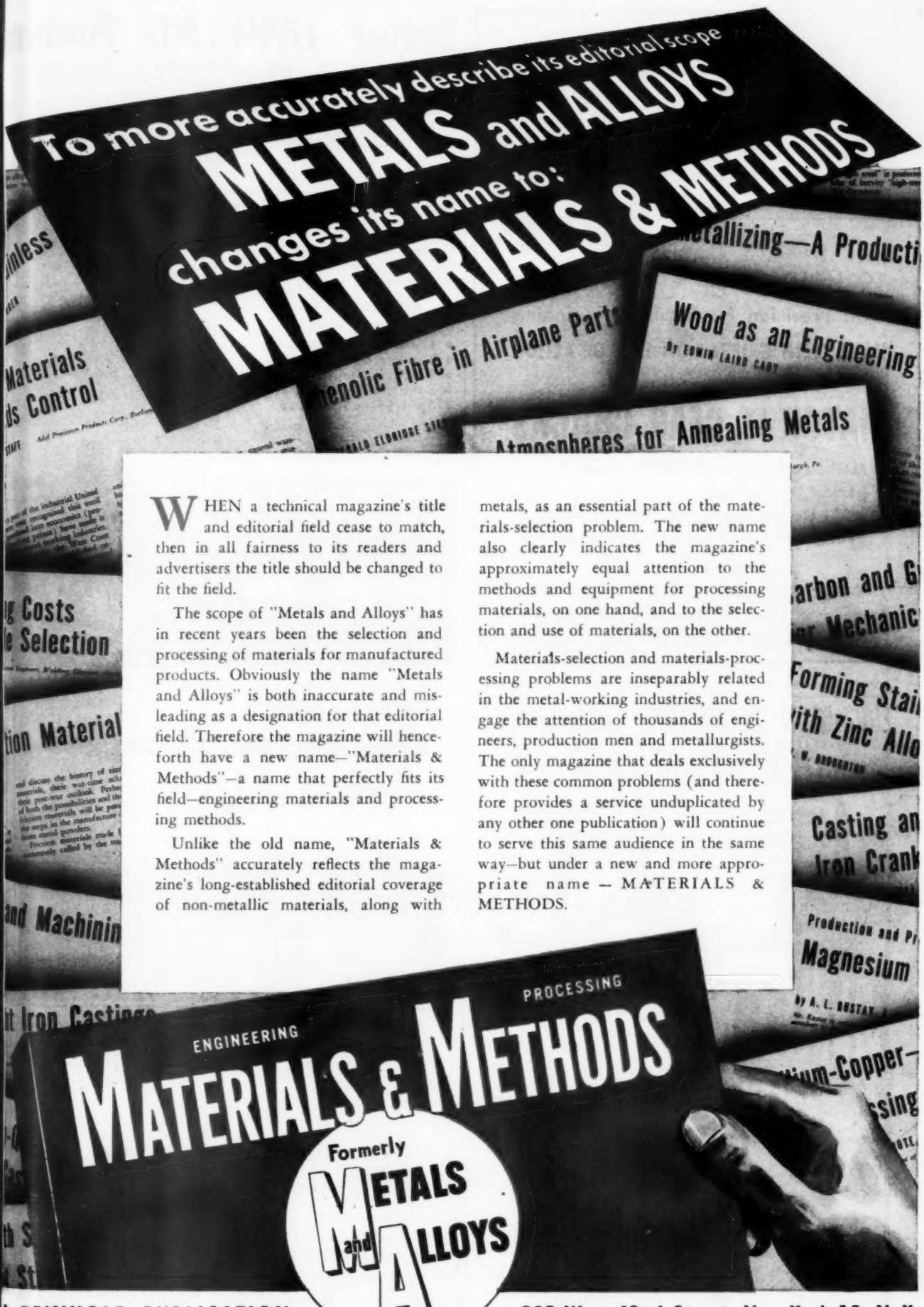

WHEN a technical magazine's title and editorial field cease to match, then in all fairness to its readers and advertisers the title should be changed to fit the field.

The scope of "Metals and Alloys" has in recent years been the selection and processing of materials for manufactured products. Obviously the name "Metals and Alloys" is both inaccurate and misleading as a designation for that editorial field. Therefore the magazine will henceforth have a new name—"Materials & Methods"—a name that perfectly fits its field—engineering materials and processing methods.

Unlike the old name, "Materials & Methods" accurately reflects the magazine's long-established editorial coverage of non-metallic materials, along with metals, as an essential part of the materials-selection problem. The new name also clearly indicates the magazine's approximately equal attention to the methods and equipment for processing materials, on one hand, and to the selection and use of materials, on the other.

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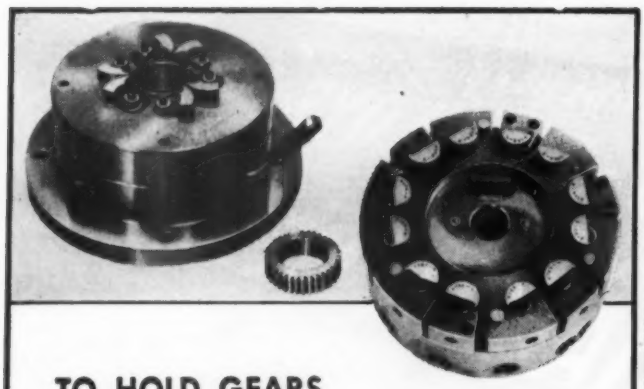

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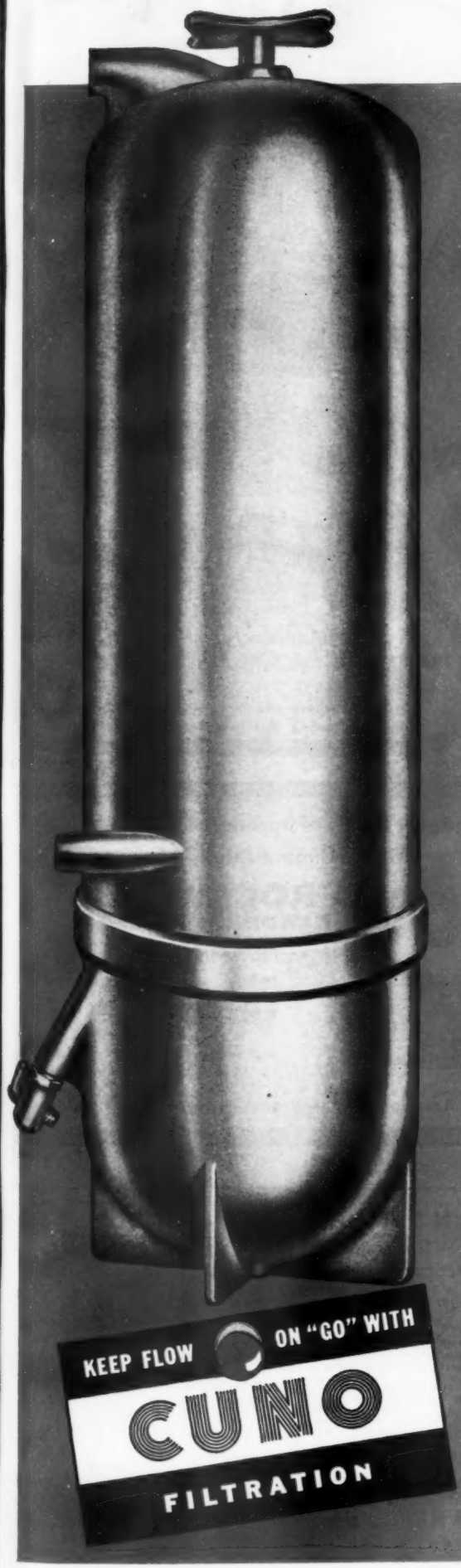

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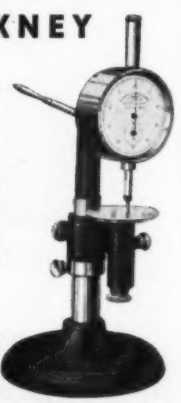

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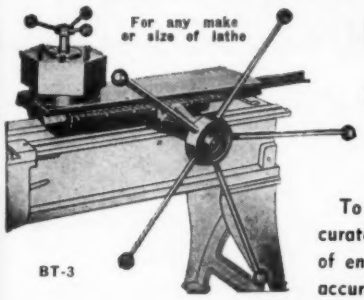

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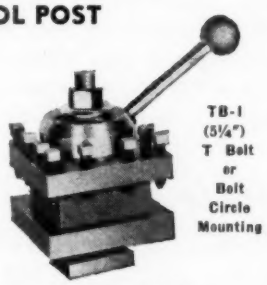

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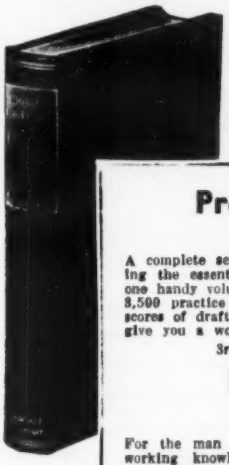

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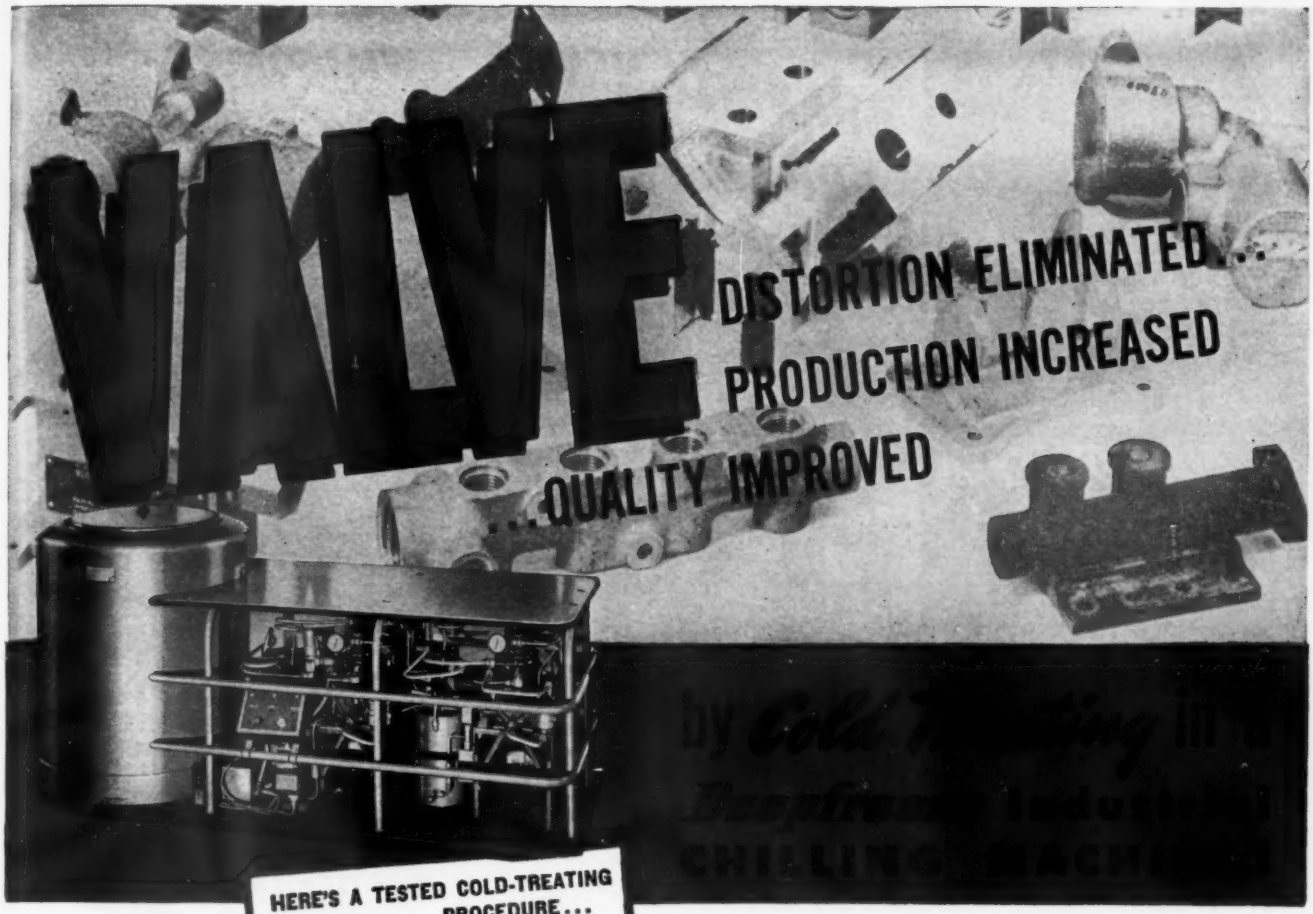

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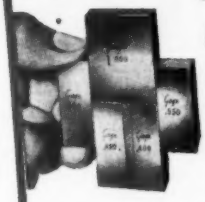

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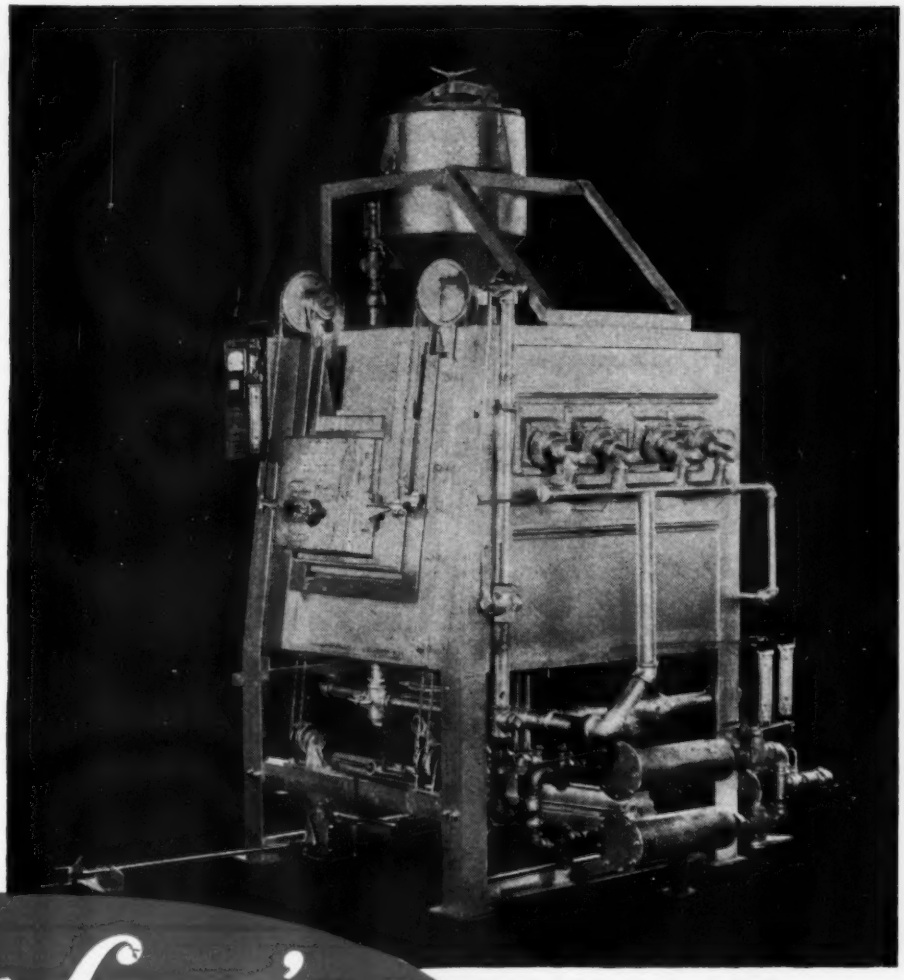

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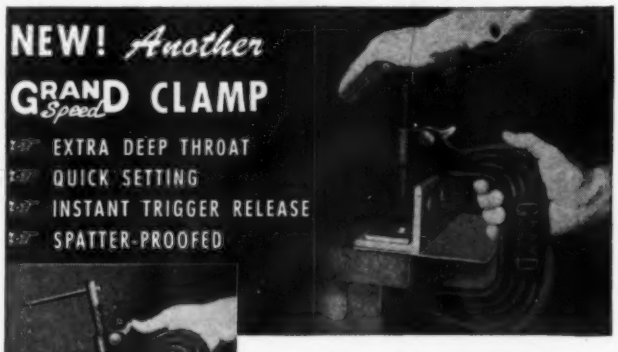

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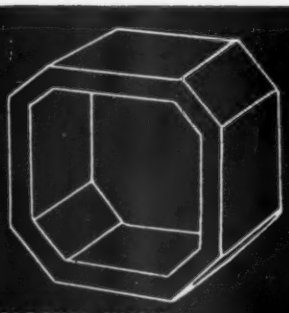
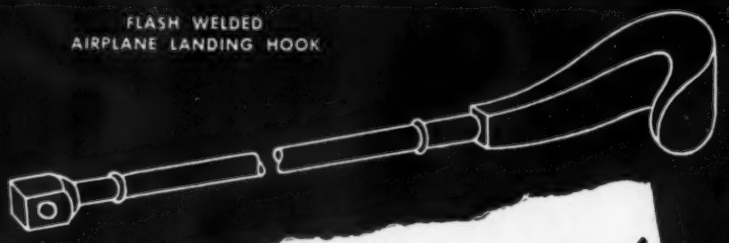


OCTAGONAL SHAPED MOTOR FRAME

FLASH WELDED AIRPLANE LANDING HOOK



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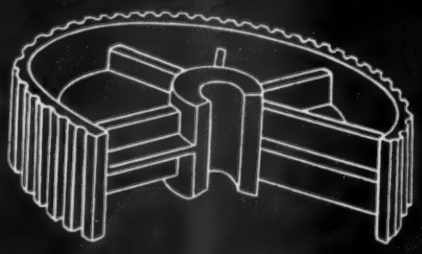

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The Treasury Department acknowledges with appreciation the publication of this message by

American Machinist

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This is an official U. S. Treasury advertisement prepared under auspices of Treasury Department and War Advertising Council

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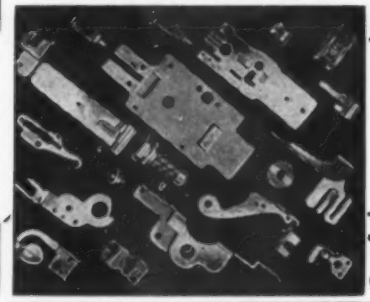

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Stock Size ½"
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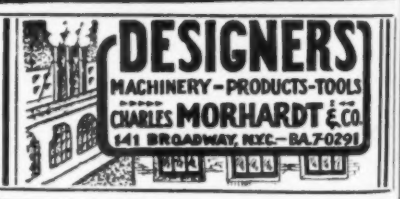

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CHIEF ENGINEER

In charge of Engineering Dept. established Mid-Western manufacturing company. Preferably an engineering degree. Must have a record of proven accomplishment as Chief Engineer or Assistant. Good executive and organizer, thorough knowledge of design, tooling, and up to date on new developments and new processes. Salary open. Send complete resume of past experiences, including salaries earned in the past and salary expected.

P-479, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
DRAUGHTSMAN
(Mechanical)

Excellent opportunity with progressive, long-established firm in Northern New Jersey. Write full details of educational background; names and addresses of former employers; age and salary desired.

P-497, American Machinist
330 W. 42nd St., New York 18, N. Y.

WANTED
MECHANICAL ENGINEER

Must be thoroughly experienced in all gear manufacturing problems as well as designing; only those with extensive gear experience need apply. Exceptional postwar opportunity. Write full history including name of university and year graduated; names and addresses of all former employers; age; salary desired.

P-345, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

DIE DESIGNING ENGINEER WANTED

Progressive Company located in a medium sized city in southern New England, within one hour's traveling time of New York. Good schools, churches, housing and all community facilities. Looking for a qualified, experienced Die Designing Engineer experienced in designing small and medium sized dies for sheet metal, aluminum, steel and brass stampings such as used in manufacturing electrical equipment. Excellent prospects for a permanent future; no reconversion shutdown. Company established over 65 years. Excellent hourly rate to start and salary for right man. Interview at plant may be arranged. Answers will be kept strictly confidential. Reply in confidence, stating all qualifications.

P-502, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

TOOL ROOM FOREMAN

Excellent opportunity. Stable and progressive concern—Western Nw York. Age 35-45. Die experience essential. Write giving details of experience, education, personal data and photo.

P-471, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

WANTED
MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

THE TAFT-PEIRCE MFG. CO.
Woonsocket, R. I.

WANTED

FIRST CLASS ENGINEER with practical experience in Machine Tool Design. Write giving resume of past experience, salary expected, and when available.

P-470, AMERICAN MACHINIST
330 West 42nd Street, New York 18, N. Y.

DRAFTSMEN — DESIGNERS

Needed in the Development and Research Department of an old established and progressive Chicago manufacturing company. Excellent opportunity for men with ingenuity and designing ability. Experience in drafting and designing small mechanical and electrical devices is required. Engineering degree desirable but optional.

P-429, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED—MACHINE DESIGNER

Experienced on special or paper working machinery. Excellent opportunity for permanent position. Location Philadelphia area. Please give complete details, age, experience, etc.

P-500, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

WANTED
MACHINE SHOP SUPERINTENDENT

Special machinery builder employing approx. 300 requires cost conscious supt. throughly grounded in best current practice. Must be capable of maintaining presen good labor relations. Excellent opportunity for wide awake man with growing organization.

P-501, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

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WANTED: YOUNG, aggressive and experienced Master Mechanic to take charge of machine shop and plant maintenance of rerolling steel mill and fabricating shop. Give education and experience. P-475, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MACHINE SHOP Superintendent—Capable and fully experienced on medium to heavy work, for highly modern shop (all new machine tools) operated in connection with large tonnage-producing steel foundry, handling both own work and contract jobs. Must be able to organize department for efficient production, and to organize and supervise estimating. Position open now; salary open to man of the right caliber. Your application should cover all details—write P-486, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DESIGN ENGINEERS and draftsmen for the design and development of chemical processing machinery. Experience in the synthetic fibre or related field and transport handling equipment for wet processes desirable but not essential. P-496, American Machinist, 330 W. 42nd St., New York 18, N. Y.

STORE KEEPER for small machine manufacturing concern to supervise and operate in all detail stockroom and tool room. Must have had similar experience with machine factory in laying out storage space handling incoming and outgoing stores and tools and keeping complete and accurate records. Salary $50.00 Opportunity. P-487, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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POSITIONS WANTED

CHIEF DRAFTSMAN: Technical graduate, mechanical engineer's degree; actual designing and shop experience directing production of many types of machinery, organizer, instructor, producer. PW-458, American Machinist, 330 W. 42nd St., New York 18, N. Y.

TOOL SUPERINTENDENT: Age 40, college education, 18 years industrial experience in product design, tool and special machine design, plant layout and plating. Present position superintendent of processing, tool design, tool room and crib. Desires position of general superintendent or assistant to works manager. PW-503, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

(Continued on opposite page)

Plant Executive Available

Practical and technical training. Thirty years experience as toolmaker, designer, chief engineer, master mechanic and shop supt. Permanent position desired. Will consider foreign assignment. 49 years old.

PW-482, AMERICAN MACHINIST
520 North Michigan Ave. Chicago 11, Ill.

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CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

POSITIONS WANTED
(Continued from opposite page)

SALE ADMINISTRATOR: or top executive assistant, experienced in marketing and the new products. M.E. Cornell University—for the last twenty years employed with a firm manufacturing and selling technical hardware specialties as executive in the following positions—vice president, secretary-treasurer, general manager, sales manager, in charge of manufacturing, merchandising, organizing sales force, training and advertising. Basic training in engineering and sales power plant equipment. Position wanted with company manufacturing technical, semi-technical products planning post-war developments. PW-455, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ASSOCIATE EDITOR: M.E. and M.S. degrees, broad shop and technical experience; engineering journals, trade papers, house organs, PW-456, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF TOOL Designer and equipment eng. Can be available about the first of the year. Prefer metal office furniture shelving, steel and aluminum chairs with a company planning to advance. PW-493, American Machinist, 520 N. Michigan Ave., Chicago, 11, Ill.

CHIEF ENGINEER: Mechanical and Master's degrees, good executive and organizer; machine tools, automatic machinery, medium and heavy machinery, gearing; design, mathematical analysis, research. PW-457, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF ENGINEER: Twenty years experience in designing and manufacturing a large variety of small pneumatic, electric and mechanical devices. Power tools, appliances and machine tool equipment. Have supervised engineers, draftsmen and machine shop help. Knows machine shop equipment, tooling and processing. A practical man well versed in modern industrial designing. College graduate, age 42. A chief engineers position is desired with a small to medium size plant. PW-504, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 458, 815-15th St., N.W., Washington 5, D.C.

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OFFERED—WANTED
Selling Agencies—Sales Executives
Salesmen—Additional Lines

WANTED

SALES MANAGER: traveling three trips yearly for the past ten years in the United States and Canada calling on 420 manufacturers representatives and mill supply companies with approximately 1700 men wants two additional lines on straight commission basis for National distribution. Prefer a machine tool line or precision tools. Reference exchanged at personal interview. RA-461, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES MANAGER, who accepted U.S. Army commission, is now released and desires position as sales manager or representative with reliable machine tool manufacturer. Has 32 years experience with leading machine tool manufacturers, 12 years as sale manager and 20 years on machine design, tool design, sales engineering, estimating, setting prices and sales representative. Is 49 years of age, in excellent health, makes good appearance, is well known, and knows his business. SA-505, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER: Fifteen years experience selling machinery, tools and plant equipment in Detroit area. Desires to exclusively represent manufacturer. Excellent references. Immediately available. RA-506, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Argentine Company with important factory of metallurgical products and vast sales organization in the principal cities of the Argentine Republic, wishes to represent well-known industrial machines, tools, ironware of all kinds, etc.

For further details please write the Lee J. Murray Company, Franklin, Massachusetts, or directly by "air-mail" to the "Sociedad Anonima Industrial y Comercial, La Metalurgica Rioplatense, Moreno 634, Buenos Aires, Argentina.

WANTED
SALES ENGINEERS

To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

SW-410, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED
SALES ENGINEER

Knowledge of Gears and Gear Application essential. Reply giving age, experience and salary expected.

GRANT GEAR WORKS, INC.
154 WEST SECOND ST., S. BOSTON

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RECONVERSION OPPORTUNITY

An old established Machine Shop during the war stepped out of its regular manufacturing line and in cooperation with the War Effort made an excellent and popular Machine Tool. Now desiring to confine its efforts to the regular line, it has been engaged in for nearly a century, it is willing to sell at a fair price the complete drawings and patterns along with the necessary equipment of jigs and tools.

BO-496, AMERICAN MACHINIST
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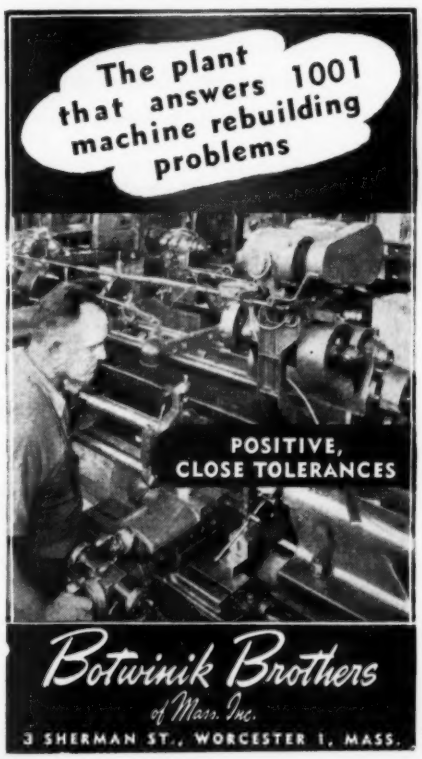
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Equipment Wanted Advertising page 350

PUBLIC AUCTION

By Order of the Board of Directors

TUESDAY, DECEMBER 11th, 1945 - 10:30 A. M.

REAL ESTATE — MACHINERY — EQUIPMENT

BASCA MANUFACTURING COMPANY, INC.

3019 Roosevelt Avenue

INDIANAPOLIS, INDIANA

MACHINERY:

35—Bliss, Toledo, Federal, R & K and Ferracute Punch Presses, Niagara and Bertsch Square Shears.

40—Monarch, South Bend, Le Blond and Advance Lathes, Midland #4 Turret Lathes, Tool and Surface Grinders, Power Saws and Filers, Internal Grinders, Shaper, Milling Machines, Radial Drills, Planer, Drill Presses, Hydraulic Press, Burring Machines, Air Compressors, Conveyors, Material Handling Equipment, Hardening Oven, Baling Press, Electric Hoists, Hoists, Etc.

33—Taylor Winfield, Federal, Thomson-Gibb, Lincoln and Westinghouse Spot and Arc Welders.

Industrial Tractor, Unitractor Mules, Shop Lifts, Hydraulic Trucks, Clark Carloader, Shop Trucks, Tier Style Box Skids, Oxweld Acetylene Generator Units, Cascade Oxygen Unit.

REAL ESTATE:

Consists of Modern Fireproof Constructed Buildings, all sprinkled, approximately 100,000 Square Feet of Floor Space. Office and Shop Building Two Story Concrete Construction, Adjoining Manufacturing Buildings One Story Concrete and Brick & Steel Construction. Excellent Railroad Side Track and Truck Shipping Facilities. Air Conditioned Offices, Cafeteria Room and Yard Space. Boiler with Automatic Stoker and Unit Heaters.

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Security Trust Bldg.
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Additional Auction Advertisement on page 353

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1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.

1—#515 National Acme 1 ⅝" 4-spindle Automatics, complete.

2—#55 National Acme 1⅜" 4-spindle Automatics, complete.

1—#2G Brown & Sharpe Automatic.

1—#1 Brown & Sharpe Automatic, old style.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72"x120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 Morse Taper. Table 20"x67".
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Woodward & Rogers, 6 spindle.
Fosdick 13" high speed, 4 spindle (2). 2 spindle (1).

RADIAL DRILLS

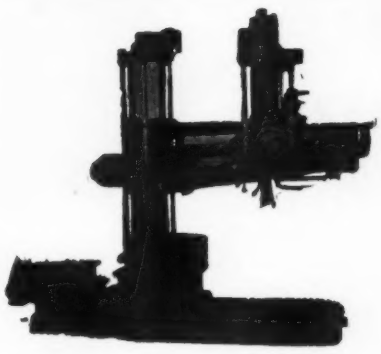
3' 9" col. American, S.P.D.
3' Dreses, 10" rd. col. QCG., M.D.
3' Fosdick 10" Col. Motor Drive.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.
16" Persons-Arter Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
6"x32" Norton Cyl., overhead c/s drive.
#2 Brown & Sharpe Surface Grinder.
#70 Heald Internal Grinder.
#60 Heald Cylinder Grinder
3—#2 Cincinnati Centerless Grinders.
1—4x12 Landis Hydraulic Cylindrical Grinder, New.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14x6 Pratt & Whitney semi—Q.C.G.
16x8 Hendey Arranged M.D., Taper
16" Warner & Swasey Fox Brass (2).
16" Dreses Fox Brass.
Putnam 26x12 Heavy Q.C.G., arr. for M.D.
Potter & Johnston #6A Automatic Chuckers; 3½". dia hole in spindle (2).
14x6 Hendey Toolroom Lathe, G. H., M.D.
14x8 LeBlond Toolroom Lathe, cone drive
14"x6' Hendey 12-speed geared head.
14"x102" centers Hendey motor driven Lathe.
20"x10' Hendey.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller.
#1-#1½-#2 Brown & Sharpe Plain Miller.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
#8 Lees Bradner Thread Miller.
#1-#2—Kempsmith Plain Milling Machines
#2½, #3 LeBlond Universal.

PLANERS

30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x24" N.-B.-P., Planer Shaper, M.D.
24"x24"x6' Cincinnati, 2 heads, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C., B.G. Forging 3" stroke.
200 ton A.C.F. Hydraulic Press. Bed 24"x 36", 4-post.
7—25 ton Model SL2 K.R. Wilson hydraulic Presses.
Beck Duplex Embossing Press.
75 ton H.P.M. 2 post, Hydraulic Press.
#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".

SHAPERS AND GEAR CUTTERS

12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
#13 Brown & Sharpe Spur & Bevel Gear Cutter.
16" Smith & Mills.

SHEARS & METAL CUTTING MACHINERY

Lennox Splitting Shear, ¾" cap.; 8' throat.
Lennox Bevel Shear, ¾" cap.
Bliss #232 Slitting Shear, 14 ga.
Gould & Eberhardt Slitting Shear, 10 ga.
Niagara 16 ga. x 42" Gap Foot Shear.
Niagara #95 Power Seamer.
Niagara 4"x42" Geared Slip-Roll Former.
Niagara 3"x36" Geared Slip Roll Former.
Niagara 48" Roller Leveller, 6 Rolls.
Niagara #4-R Squaring Shear, 48"x¼" capacity, M.D.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open dia, ½" cap. & 6".

Manville Cold Header, single stroke, solid die, 3/16" cap.

J. C. Miller Co. Lacquer Heater Tank with acquistat.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
Hydraulic Pumps—Hele Shaw, Racine, Oil Gear, Motor Driven.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½. New this year.
High Speed Riveter, #5B.

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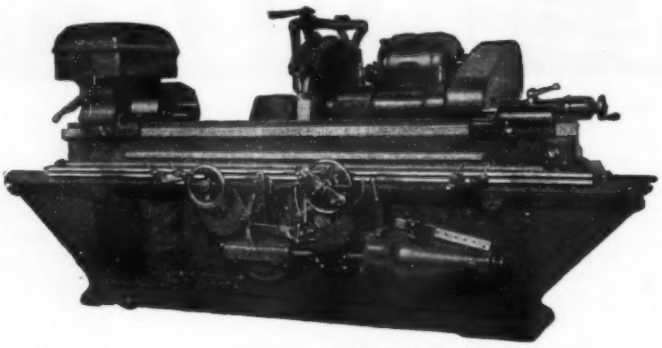

SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
	16x36	24x96

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200 H.P. Hor. 4 Pl. Motor Driven Pump, Capacity 78 G.P.M. 4000#
2300 Volt Synchronous Motor 3 Phase 60 Cycle
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200 H.P. Horizontal 4 Pl. Pump—200 G.P.M.—1500#
18"x15' Accumulator 1500#
500 ton down moving ram hydraulic press 42" stroke, 28" between rods.

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Specialists in Hydraulic Equipment

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UNUSUAL VALUES

Blueprint machine—3 pieces
Drill, high speed 7' overhang single spindle
Drill, 21" Rovernford Bk Grd. Pr. Feed
Drill, two-spindle sensitive, #1 Morse taper
Drill, 4-spindle sensitive
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
HackSaw, 12 x 12 Racine for Motor Drive
22" Buffalo Pr. Fd. Motor Drive
16" x 6' Hendey Lathe, Quick Change Gear
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ⅝" & ⅞" capacity
Shaper, 24" Gould & Eberhardt
Shaper, 16" Barker
Threading Machines, #0 Webster & Perks
Tool Grinder, Sellers new #0, #1 and #2 magic chuck and collets

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

Boring Mills, 36"-42"-52"-72"-96".
Bolt Cutters 1"-1½"-2"-2½" Acme-Landis
Lathes, 20" to 30" Geared Head, M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Planer, O. S. 60"x60"x14' D. & H., M.D.
Profiler, #13 P. & W., B.D.
Shapers, 10"-20"-24"-56".
Shaper 36" Morton, Draw Cut

West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

#49 HEALD DOUBLE HEAD BOREMATIC BORING MACHINE

New February 1943. Motor driven. Equipped with hydraulic cross slide arranged to feed to two directions.

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ALL PRACTICALLY NEW — BUILT AFTER 1941

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8—BROWN & SHARPE No. 2 Universal
2—BROWN & SHARPE No. 2A Universal
4—VAN NORMAN No. 22L Universal
2—VAN NORMAN No. 36 Universal

MILLING MACHINES
Automatic & Thread

1—BROWN & SHARPE No. 000 Automatic (Plain)
8—BROWN & SHARPE No. 10 Automatic (Plain)
24—BROWN SHARPE No. 12 Automatic (Plain)
24—KEARNEY & TRECKER No. 1218 Simplex Automatic
2—PRATT & WHITNEY Model C 6 x 20" Thread
5—LEES BRADNER No. LT Thread

TURRET LATHES

9—WARNER & SWASEY No. 3 Universal
6—WARNER & SWASEY No. 4 Universal
4—WARNER & SWASEY No. 1A
7—WARNER & SWASEY No. 2A
2—BARDONS & OLIVER No. 2
2—BARDONS & OLIVER No. 3
1—BARDONS & OLIVER No. 5

SCREW MACHINES — Hand

1—BROWN & SHARPE No. 0, wire feed, 3/8" cap.
2—BROWN & SHARPE No. 1, wire feed, 5/8" cap.
2—BROWN & SHARPE No. 2, wire feed, 1" cap.

LATHES — Engine

8—MONARCH 10" x 20" Sensitive Precision Toolroom
4—HENDEY 12" x 30" 12-speed geared head
4—HENDEY 12" x 54" 12-speed geared head
4—HENDEY 14" x 42" 12-speed geared head
4—HENDEY 12" x 54" #1 Precision H.S. Turning
4—HENDEY #3, 54" High Speed Turning

LATHES — Speed

7—BLOUNT 4' x 6' bed
14—HAMMOND type L
14—HAMMOND No. 5

GRINDERS — Plain

8—BROWN & SHARPE No. 5 Cylindrical
1—BROWN & SHARPE No. 23 Cylindrical
2—LANDIS type H, 4 x 18" Hydraulic
3—LANDIS type C, 10 x 48" Hydraulic

GRINDERS — Universal

5—BROWN & SHARPE No. 1—max. dia. work 1"
3—BROWN & SHARPE No. 2—max. dia. work 5"

GRINDERS — Internal

1—HEALD No. 70A 3-motor drive

GRINDERS — Surface

21—BROWN & SHARPE No. 2B
6—NORTON 6 x 18 hydraulic
3—ABRASIVE No. 3B
1—PRATT & WHITNEY 14x60" Vertical
6—BLANCHARD No. 18

GRINDERS — Tool & Cutter

15—LeBLOND No. 2 Univ. Tool & Cutter
2—GORTON Cutter
1—TAYLOR FENN Cutter
7—PRATT & WHITNEY Contour

DRILL PRESSES — High Speed

4—ALLEN Bench Type HMDB
2—ALLEN single spindle type WB
1—ALLEN single spindle #3
1—ALLEN two-spindle #2 type WB
16—ALLEN three-spindle type B
2—ALLEN five-spindle type WB
12—ALLEN six-spindle type B

DRILLING MACHINES — Deep Hole

4—PRATT & WHITNEY 2-spindle
4—PRATT & WHITNEY 1/2B x 30" 2-spindle

SHAPERS

1—HENDEY 12" high speed
1—HENDEY 24" Standard Crank
1—CINCINNATI 24" Heavy Duty

PRESSES

7—GREENERD Arbor—Nos. 3 1/2, 4, 5
3—WATSON STILLMAN Hyd. Straightening
4—BILLINGS & SPENCER No. 2 Hot trimming

MISCELLANEOUS

4—BROWN & SHARPE No. 2G High Speed Auto. Screw Machines
4—BILLINGS & SPENCER Mod. D", 1200" cap.
1—BAKEWELL Precision Type Tapper
4—PEERLESS 6 x 6" High Duty Metal Saw
20—MOREY No. 12M 2-spindle Profilers
2—PRATT & WHITNEY No. 12B 2 spindle Profilers
1—TANNEWITZ Type Q.S.T. Variety Saw Table
1—WORTHINGTON Pump Type BH Air Compressor
2—GRANT No. 3A Rotary Vibrating Riveting Machines
2—TOWNSEND 7" Standard Riveting Machines
2—M.R. 8-Metal Parts Washer—COLT'S
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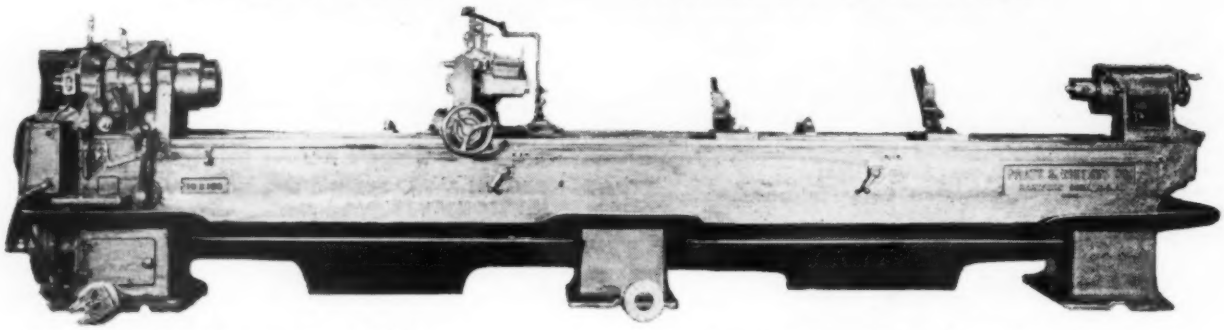
10" x 168" Pratt & Whitney THREAD MILL

IMMEDIATE DELIVERY — EXCELLENT CONDITION



Length that can be cut between centers 168"
Dia. external thread that can be milled 10"
Lead that can be cut with regular gears: minimum, threads per inch 12; maximum, lead 48"
Depth that can be cut 1-9/16"
Collet capacity 3½"
Follow rest capacity 3½"
Index ring, regular, number of notches 12
Lead screw, threads per inch 2
Speeds: work spindle speed changes (by slip gears) 17; spindle speed, min. r.p.m. 0.08; spindle speed, max. r.p.m. 1.27; cutter spindle speeds (5) 44 to 144 r.p.m. with miscellaneous collets and equipment. Arr. for motor drive with 3 H.P. A.C. motor

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2—#3H MILWAUKEE PLAIN MILLING MACHINES

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1—#3 CINCINNATI PLAIN MILLING MACHINE, DIAL TYPE

1—#2H MILWAUKEE VERTICAL MILLING MACHINE

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Machine Tools

#4-H Kearney & Trecker Vertical Miller, 1943
#5 Bardons & Oliver Turret Lathe, bar & Chucking, 1942
#5 Jones & Lamson Turret Lathe, Chucking, 1940
#3B Abrasive Automatic Surface Grinder, 1940
8" x 48" Jones & Lamson Automatic Thread Grinder, 1940
12" Gleason Straight Bevel Gear Generator, 1940
12" Hendey High Speed Crank Shaper, 1940
#4 Cincinnati High Power Plain Millers SPD (2)

Many more, large and small. Send us your inquiries.

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30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

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#36 HANCHETT ROTARY SURFACE GRINDER

Motor driven with 30 H.P. A.C. motor. Equipped with 36" magnetic chuck.

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High speed tapper taps, bent and straight shank. Sizes ranging 3/56 to 10/32 in 90° bent shank. Sizes ranging ¼-28 to ½-20 NF in 90° & 180° bent shank. Sizes ranging ¼-28 to ¾-16 in Acme and straight shank 15" overall. ALL GOOD STANDARD BRANDS FOR IMMEDIATE DELIVERY.

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24" BULLARD New Era Vertical with one swiveling turret head and one side head. AC or DC motor drive.

42" BULLARD New Era Vertical with one swiveling turret head and one side head. AC or DC motor drive.

NO. 1 PUTNAM Vertical Car Wheel Boring Mill with side head for hub facing and hoist. AC or DC motor drive.

48" NILES-BEMENT-POND Car wheel Boring Mill with hoist. AC or DC motor.

100" NILES-BEMENT-POND Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

120" BETTS Heavy Vertical with two swiveling heads, Power Rapid Traverse, AC or DC motor drive.

120" NILES-BEMENT-POND Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

120" CINCINNATI Massive Pattern Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

10'-16' CINCINNATI extension Type Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

NO. 32 3¾" Bar LUCAS Horizontal Table Type Boring, Drilling, and Milling Machine, Power Rapid Traverse. AC or DC motor drive.

4½" Bar NILES-BEMENT-POND Horizontal table type boring, drilling and milling machine, duplex control. AC or DC dr.

5½" Bar NILES-BEMENT-POND Heavy floor Type Horizontal Boring, Drilling, Milling Machine. AC or DC motor drive.

RADIAL DRILLS

4' HAMMOND High Speed Sensitive Drill, Lever Feed with Tapping Attachment, AC or DC motor drive.

5½' AMERICAN Full Universal Triple Geared with tapping attachment. Single pulley belt drive or AC or DC motor dr.

6' CARLTON Plain 15" round column with DC motor on arm, tapping attachment.

8' NILES-BEMENT-POND "Right Line" Plain with 230 volt DC motor on arm, tapping attachment.

GRINDERS

12" O.S. WALKER Single Stroke Surface Grinder with 12" dia. magnetic chuck and 7½ HP, AC or DC motor.

NO. 16 BLANCHARD High Power Vertical Surface Grinder with 26" magnetic chuck and 20 HP, AC or DC motor.

NO. 1 BESLEY Disc Grinder with two 12" dia. steel discs and two plain tables, belt drive through countershaft.

LATHES

27"x12' AMERICAN 8 speed geared head, 96" between centers. AC or DC motor.

42"x36' PUTNAM Geared Head, 25' between centers. Quick change gear box. AC or DC motor drive.

48"x30' BRIDGEFORD 9 speed geared head, 20' between centers. Triple geared internal face plate drive. AC or DC.

48"x20' NILES-BEMENT-POND Extra Heavy Geared Head, 11'5" between centers. Power cross and angular feed to compound rest. Semi-quick change gear, taper attachment.

48"x59' BRIDGEFORD Boring and Turning with 9 speed geared headstock, turning carriage with compound rest, AC or DC motor drive.

NO. 4 PUTNAM Extra Heavy Center Drive Axle Turning Lathe with two carriages. AC or DC motor drive.

27" Swing 98" Centers BRIDGEFORD Plain Turning Lathe for car axle or heavy forgings, two carriages and tool rests. Single pulley belt drive or AC or DC motor drive.

42" PUTNAM Heavy Double End Car wheel lathe. Equipped with overhead hoist for loading wheels and axles.

72"x77' (65'-6" centers) NILES-BEMENT-POND Heavy Geared Head Lathe. Two carriages with compound rests, power cross and angular feed. Power rapid traverse. Taper attachment.

MILLERS

NO. 2 CLEVELAND Plain, table 13"x50" B & S Taper No. 11. Single pulley belt drive or AC or DC motor.

NO. 3B BROWN & SHARPE Plain with double overarm table 14"x60" with 7½ HP, AC or DC motor.

NO. 4 CINCINNATI High Power Plain. Power rapid traverse table 16½"x64". Single pulley belt drive or AC or DC.

NO. 5B BROWN & SHARPE Plain, Power rapid traverse. table 22"x81". AC or DC

No. 3 CINCINNATI high power vertical, power rapid traverse, table 59" x 13", single pulley belt drive or motor drive.

NO. 1½ KNIGHT Vertical Milling and Drilling with power longitudinal feed to tilting table. Table 7½"x29", AC or DC.

NO. 4 CINCINNATI High Power Vertical, Power rapid traverse. Table 16½"x 64". Single pulley belt drive.

24"x24"x12' INGERSOLL Horizontal Spindle Slab Miller with adjustable rail.

30"x30"x10' NEWTON Horizontal Spindle Slab Miller with adjustable rail, table 27"x11'. AC or DC motor drive.

24"x36"x12' INGERSOLL Planer Type side milling machine with two power feed heads on housings for side milling only.

24"x24"x12' INGERSOLL Planer Type milling machine with one head on adjustable rail and two side heads, AC or DC motor drive.

42"x26"x12' INGERSOLL Planer Type milling machine with two heads on adjustable rail & two side heads, AC, DC.

PLANERS

36"x36"x14' PUTNAM Heavy Planer with two heads on rail. 230 Volt DC reversing type planer motor and control.

38"x38"x14' OHIO Heavy with two heads on rail and one side head. 230V DC reversing type planer motor and control.

48"x48"x16' NILES - BEMENT - POND Heavy with two heads on rail and two side heads. 230V DC reversing type planer motor and control.

48"x48"x18' G.A. GRAY Spiral Drive with two heads on rail and one side head. AC motor drive with self-contained countershaft.

48"x48"x24' NILES - BEMENT - POND Heavy with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

48"x48"x32' G. A. GRAY Spiral Drive with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

48"x48"x24' NILES - BEMENT - POND Heavy with two heads on rail and one side head. AC motor drive through self-contained countershaft.

48"x48"x20' F. R. PATCH Heavy with two heads on rail and two side heads. 230V DC reversing type motor and control.

60"x48"x18' G. A. GRAY widened Spiral Drive with two heads on rail and one side head. AC motor drive.

72"x72"x18' NILES - BEMENT - POND Heavy, two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

72"x72"x20' NILES - BEMENT - POND Extra Heavy, two heads on rail and two side heads, 230 Volt DC reversing type planer motor and control.

84" WIDENED TO 98"x32"x42' SOUTHWARK Extra Heavy, two rail heads and two side heads. 230 Volt DC reversing type planer motor and control.

16'x10'x30' BETTS heavy, two heads on rail and two side heads, forced feed lubrication. 230 Volt DC reversing type planer motor and control.

MISCELLANEOUS

6" PRATT and WHITNEY Vertical Shaper.

NO. 3 CRESCENT Double Arbor Saw Table, table top 36"x48", diameter of saws used 16", AC or DC motor drive.

30' NO. 3 HILLES JONES Plate Edge Planer.

30'x⅞" NILES-BEMENT-POND Plate Bending Rolls, pyramid type.

14'x½" NILES-BEMENT-POND Plate Bending Rolls, pinching type.

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NOW IN STOCK

No. 61—1⅝" NEW BRITAIN SIX SPINDLE AUTOMATIC SCREW MACHINE, with bar equipment, new in 1943.
No. 2 WARNER & SWASEY TURRET LATHE twelve speed, all geared head, with power bar feed, new in 1941.

BROACHES
No. 3 American, rack type.
No. 4 LaPointe, screw type.

DRILLS
★ **4 Ft. Canedy-Otto Radial Drill, motor spindle, 11" column, new in 1942.**
No. 416 Baker, single spindle.
★ **21" Cincinnati-Bickford Direct Motor Driven Drill, single spindle.**
42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS
★ **No. 7, 71A, 715A Fellows Gear Shapers, all manufactured in 1936, with spur or helical guides, motor driven.**
No. 6 Fellows Gear Shaper, m.d.
★ **96" Gleason Spur & Bevel Gear Planer.**
No. 12 Barber Colman Gear Hobber.
No. 5—48" Cincinnati Automatic Gear Cutter.

GRINDERS
★ **15" x 15" x 96" Norton Surface Grinder, m.d.**
76" Rogers Knife Grinder, type B.
No. 16-26" and No. 16-30" Blanchard Surface Grinder.
11" x 72" Brown & Sharpe Cylindrical.
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
★ **No. 35 Excello Thread Grinder, new in 1941.**
No. 13 Brown & Sharpe Universal & Tool Grinder.
10" x 36" Norton Cylindrical Grinder.
No. 2 Cincinnati Centerless.
★ **No. 3 Cincinnati Centerless Grinder, m.d.**

LATHES, ENGINE
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No. 4, 6 Warner & Swasey, c.d.
★ **42" Bullard VTL, New Era type.**

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No. 4 LeBlonde Plain, c.d.
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6" x 14", 6" x 48", P. & W. Thread Mill.
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MISCELLANEOUS
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36" x 36" x 10' Woodward & Powell Planer, 2 heads.
25" Smith & Mills Crank Shaper, s.p.d.
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Cincinnati 48" Auto. Pl. Prod. Miller, S.P.D.
W.&S. No. 2A & #1-A grd. hd. Univ. Turret Lathe, S.P.D.
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The supply of surplus tools is sufficient to meet all of the needs of industry, and in the event that your local R.F.C. Regional Office cannot fill your specific requirements, it will endeavor to locate needed equipment from other offices throughout the country.

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GISHOLT 42"—2 heads

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COLURN D-2 Upright
NATCO No. 12, multiple spindle

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BROWN & SHARPE 60"x12" Spur Gear
FELLOWS No. 712
GOULD & EBERHARDT 36" Hobber

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GLEASON 10" and 15" Spiral
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ARTER Automatic Piston Ring
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BROWN & SHARPE No. 4 Universal

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LODGE & SHIPLEY 20"x10' geared head
MONARCH 24"x10' geared head
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JONES & LAMSON 2¼"x24"
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BROWN & SHARPE No. 2
BARDONS & OLIVER 2" capacity

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PRATT & WHITNEY 4" Spline
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SUNDSTRAND Rigid Mill; Table 60"x14½"

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CINCINNATI 36"x36"x10'—4 heads
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GRAY 72"x48"x12'—2 heads
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AUTOMATICS, Cleveland 3½" 4 spdle, Mod. K4
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GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
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GRINDERS, Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
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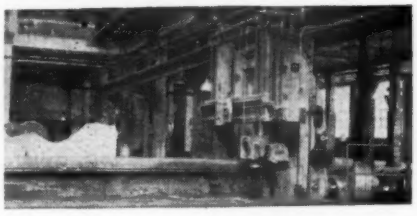

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#2, #3, #4 and #5 Universal M.D. Cincinnati, Brown & Sharpe, Milwaukee
#2H Milwaukee, Plain, M.D.
#4B Brown & Sharpe, Plain, M.D.
#4 Milwaukee, Plain, M.D.
#08 Cincinnati, Vertical, M.D.
#2 Brown & Sharpe, Vertical, M. D.
Pratt & Whitney and Lees Bradner Thread Millers
Brown & Sharpe and Cincinnati Production Millers, M.D.

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2", 2½", 2¾" Cleveland, M.D.
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Gridleys, Conomatics, New Britains, latest models.

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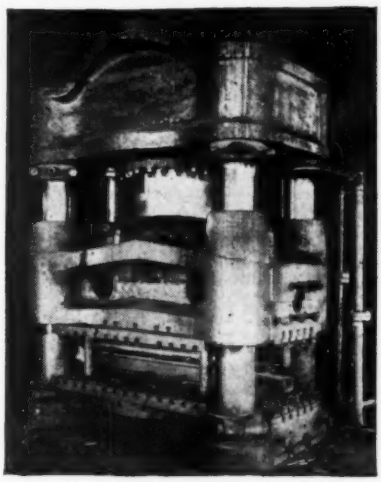

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3" Gleason Straight Bevel Gear Generator, m.d.
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12" Gleason, m.d.
9" Pratt & Whitney Hydraulic Spur Gear Grinder m.d.
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No. 3-36" Brown & Sharpe Spur
No. 4-38" Brown & Sharpe Spur
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Cincinnati Gear Burnisher, m.d.
No. 12 Barber-Colman Double Overarm Gear Hobber m.d.
No. 13LS Fellows Gear Lapper, m.d.
No. 36B Gould & Eberhardt Spur & Bevel Gear Cutter, m.d., latest
No. 36S Gould & Eberhardt Spur Gear Cutter, m.d.
No. 61 Fellows Gear Shaper, belt
No. 64-S Fellows Gear Shaper, m.d.
No. 71A Fellows H.S. Gear Shaper, m.d.
Cross Gear Tooth Rounder, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.d.

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No. 2 Cincinnati, m.d., 1942 machine
Cincinnati Valve Seat Grinder, m.d.

PLAIN CYLINDRICAL GRINDERS

6x18" Landis, m.d.
6x32" Fitchburg Type A, m.d., latest
6x32" Norton, belt
8x36" No. 12 Brown & Sharpe, belt
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10x36" Cincinnati Plain Hydraulic, m.d.
10x21" Landis, m.d.
10x48" Brown & Sharpe, belt
10x48" Landis Type C Hydraulic, m.d., latest
10x72" Landis, m.d.
12x36" Cincinnati, belt
12x36" Landis, m.d.
12x36" Modern belt
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Modern, m.d.
12x72" Brown & Sharpe No. 16, belt
12x96" Landis, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
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20x120" Landis Plain, with gap, m.d.
26x96" Landis Plain, m.d.

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No. 16-22" Bryant, m.d., hydraulic latest type
No. 24-20 Bryant Hydraulic, m.d., late
No. 6, 10, and 20 Bryant, belt
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.

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No. 2 Brown & Sharpe Automatic, m.d. in base, latest type
No. 3 Gallmeyer & Livingston, m.d. in base, hydraulic
No. 500—170" Hanchett Face, model Md, traveling head type, very late
Builders Iron Foundry Co. m.d.
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Vertical Type B, m.d.
54" Bridgeport Knife, belt
28"x38"x12' Gray Planer Type, Surface, m.d.
No. 33 Abrasive Vertical, m.d.
Baldwin-Tuthill Knife No. 76D, m.d.
No. 1 Fraser Lapper, 26" plate

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I96A Gallmeyer & Livington Drill Grinder, m.d.
Type 05D Sellers Bench Type Drill Grinder
No. 1 Cincinnati Universal Tool & Cutter Grinder, belt
Gisholt Tool, belt
No. 3 Gallmeyer & &Livingston Tool & Cutter, m.d. in base
Gleason Cutter, belt
Gould & Eberhardt Gear Cuter, belt

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12x36" Cincinnati, belt
14x48" Cincinnati Model EA, m.d., very late
16x68" Landis, belt

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2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
54" Colburn, M.D., 2 hds.

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Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

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P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", MD.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D., Reid
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.
B. & S. No. 10 1' Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, B.D.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x36' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS

B. & S. No. 2, 6F Hand Screw
B. & S. No. 00, 0, 2
5 Spdle. Davenport 9/16" cap.
Cleveland Model A ⅛", 5/16", 1¼", 2"
Cleveland Model B 1", 2"
P & J. 6A, M.D.
⅞" Cone 4 spindle

New In Stock

5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
Halco Vertical Milling Heads, Drill Presses
Kalamazoo Metal Band Saw

RADIALS

3', 4', 5', 6', 8' American Triple Purpose
3', 2½', 4', 5' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

Gorton 8 D Vertical, M.D.
Cincinnati, #2 Univ.
10" P. & W. Auto.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B. & S. Universal
K. & T., B. & S. No. 2, 3 like new
B. & S. No. 2, 3, Vert.
Kempsmith No. 1 Univ.

MISCELLANEOUS

Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½" B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Natco No. 13 Multiple Spindle Drill
48" Southwark gate shear ½" 24" gap.

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No. 4 Cincinnati High Power Miller with Turchan follower or duplicating attachment.

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2½" capacity No. 7A Jones & Lamson saddle type turret lathe with lot of equipment.

14" Pratt & Whitney hydraulic feed vertical surface grinder with magnetic chuck.

12" Betts Heavy Duty crank slotter.

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BROACH. No. 2S Lapointe hydraulic

BROACH. No. 1 Foote Burt vert. surf. hydr.

BUFFER. No. 40 Standard Elec. NEW.

DRILL. 21" Canedy Otto upright. NEW.

GEAR SHAPERS. Nos. 7 & Z1 Fellows

GEAR HOBBERS. Nos. 16HS & 18H G. & E.

GRINDER. 6"x18" Thompson hydr. surface

GRINDER. 12"x36" Grand Rapids hydr. surf.

GRINDER. 16", No. 10 Blanchard surface

GRINDER. No. 2 Cincinnati centerless

GRINDER. No. 2 Brown & Sharpe univ.

GRINDER. No. 72A3 Heald Sizematic Internal.

LATHE. 14"x18" Monarch Magnamatic

LATHE. 15"x22½" Sundstrand automatic stub.

MILLER. No. 1½ Standard Hand. NEW

MILLER. No. 2 Kent Owens Hand.

MILLER. Ingersoll rotary & planer type (11)

SHAPER. 32" Morton draw-cut, M.D.

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#2 Cincinnati Tool and Cutter Grinder
Model P-5 Norton Buraway Grinders
#2 Cincinnati Centerless Grinders
2—#3 Centerless Grinders
#72A3 Heald Sizematic Grinder
Two #72A5 Heald Internal Grinders
14" x 16" x 60" Mattison Surface Grinder
#6 Landis Semi-Automatic Thread Grinder
#36 Hanchett Rotary Surface Grinders

LATHES
One 20" x 9' LeBlond Geared Head Lathes
18" x 10' Sidney Geared Head Lathe
#12 Gisholt Hydraulic Production Lathe

MILLERS
Four #0 Sundstrand Type B. Rigidmils
Four #2-24 Cincinnati Plain Hydraulic Millers
#2H Milwaukee Plain Miller
One #2K Milwaukee Plain Millers
Two #1248S Milwaukee Simplex Millers
Four #2H Milwaukee Vertical Millers
#2K Milwaukee Vertical Millers
4½" x 36" Pratt & Whitney Thread Miller

TURRET LATHES
Three #3 Warner and Swasey Universal Geared Head Turret Lathes
Three #2F Foster Fastermatic Geared Head Turret Lathes
Nine #5U Foster Universal Geared Head Turret Lathes
Two #5 Jones & Lamson Universal Geared Head Turret Lathes
Two #8A Jones & Lamson Universal Geared Head Turret Lathes

MISCELLANEOUS
Two #401 Campbell Cutomatics
#425 Campbell Cutalator
40KW High Frequency Heating Unit
2½" Landis Threading Machine
Anodizing Unit
#49 Heald Double Head Borematic
Magnaflux Unit
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Large selection of Drill Presses, small grinders, tools. Machines may be inspected under power. Representative at plant Mondays through Fridays. Partial listing.

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1—24" x 240" Norton Type C. Plain Cylindrical A.C. M.D.
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2—#3A Warner & Swasey, Taper, Threading Etc. Serial 649000 A.C. M.D.
1—#4A Warner & Swasey, Threading, Chuck. Serial 649000 A.C. Motor.
1—#5 Warner & Swasey Universal Turret Lathe, Air Chuck, Serial 620000 A.C. M.D.

BORING MILLS
36" & 42" Bullard New Era Vertical Turret Lathes, A.C. M.D.
12' Niles Bement Pond Vertical Boring Mill, 2 Heads, Geared Feeds. D.C. Drive.
42' Niles 2 Head Boring Mill, reasonably priced.

LATHES
18" x 54" Hendey Geared Head. A.C. M.D. New in 1941:
24" x 14' Lodge & Shipley Sel. Grd. Hd. S.P.D:
25" x 12' LeBlond Grd. Head, A.C. Motor drive, Taper.
27" x 16' Lodge & Shipley Geared Head, A.C. M.D. Taper
36" x 30' Lodge & Shipley Geared Head, Two Carriages, Q.C.

MILLING MACHINES
#3 Cincinnati Vertical H.P. S.P.D.
#4 Cincinnati High Power, A.C. M.D. Rapid Traverse, Vertical.
#5 Cincinnati Rect. Overarm, Rapid Traverse, S.P.D.
#2K Milwaukee Plain Milling Machine A.C. M.D. in 1941.

GRINDERS
16" x 50" Hill Clarke, A.C. M.D.
18" x 85" Landis Crankshaft.
16" x 24" x 96" Mattison Hydraulic Surface Grinders, A.C M.D.

PLANERS
60" x 48" x 24' American, 4 Heads.
24" x 24" x 10' Powell Planer, 2 Heads.

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MILLERS: (2) Morey #12M Vertical Miller & Profiler (1941)

Power Feed, completely motorized, 2 spindle, original cost $3700. each; our Price each $750.

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RIVETER: Farnham Countersinking Mill, 36" Reach, Hydraulic, motorized, 1942. Cost new $1755. Our Price $375.

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TIMKEN BEARING—MOTOR DRIVEN

3 phase 60 cycle 220-440 volt

LUCAS No. 41, 3" bar Hor. Boring Mill
LUCAS No. 42, 4" bar Hor. Boring Mill
BULLARD 36" spiral drive Ver. Turret Lathe with side heads
MONARCH 14" x 30", 14" x 54", between centers, 16 speed head lathes
LODGE & SHIPLEY 14" x 30" centers; taper
LODGE & SHIPLEY 14" x 78" centers; taper
LODGE & SHIPLEY 16" x 30" centers; taper
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BROWN & SHARPE No. 2B Surface Grinder
B & S No. 3 Univ. Grinder
B. & S. No. 2A Heavy Univ., dble. overarm
B. & S. No. 2B Plain; dble. overarm
MILWAUKEE No. 2H, Plain Miller
MILWAUKEE No. 2H Univ. Miller
VAN NORMAN Nos. 12, 26 Univ. Millers
P & W 4½"x12" Thread Miller, Model C
MOREY-SHIELDS 12"x60" Thread Miller
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4½" x 36" PRATT & WHITNEY MODEL C THREAD MILLER

New November 1944. Motor driven with internal and external hobbing attachments.

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#3F-Fastermatic Turret Lathe, all Hydraulic, 4½" hole, 1 yr. old
#4 Univ. Milling Machine $2,500.00
5" Bar Newark Horizontal Boring Mill, 8' Bed, M.D., $2250.00
16x96 Landis External Grinder, self contained
#17 Barber Colman Heavy Duty Gear Hobber, can take a hob up to 5¾" dia.
16" 8-sp. Bullard Mult-Au-Matics, 2 yrs. old
B & S Surface Grinders 2 yrs. old
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300 amp. arc welders 1 yr. old
10x36 Norton Hydraulic Grinder, 1 yr. old

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Also Power Shear Press to 12 foot bed up to 11 gauge capacity under 11 foot in height, wire description, condition, age and price to

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20"x72" LANDIS, 24" Swing, Coolant Pump, M.D.
8x36" MODERN, Self Cont., Coolant Pump & Tank.
No. 11 BROWN & SHARPE, 6x32", Motor Drive.
No. 22 LANDIS, 12x34", Pump and Pan, Power feed
6x32" NORTON Coolant Pump
3" LANDIS BALL RACE

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No. 75 HEALD, 17" swing, 14½" bet. coolant pump
No. 72 HEALD SIZEMATIC, Hydr. Feed M.D. Ball Bearing Spindle, Oil pump and pan, 15" swing
No. 52 GREENFIELD HYDROILS (2), Hydr. Feed, Ball Bearing Spindle, Pump and Pan

SURFACE

3—No. 3 ABRASIVE 22x8x12", M.D., with Mag. Chucks.
3—#78 W. & M., 7x17" table, magn. chucks
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15"x15"x96" NORTON; A.C., M.D.; Coolant Pump, Pan; 2 Mag. Chucks
12" PERSONS ARTER ROTARY SUFACE, Power Feed
8" HEALD ROTARY SURFACE, Power Feed
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No. 1½ CINC. UNIV., 5x30½" table, M.D.
No. 1 LEBLONG UNIV., 5¼x29", Table.
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MODEL 10-W HAMMOND DBLE. END WET CARBIDE TOOL 11x19" tables, M.D.
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#2 & #3 BROWN & SHARPES
12"x36" CINCINNATI UNIVERSAL CYL., Motor Drive, coolant pump
BATH UNIVERSAL, 10" swing, Power Feed, belt drive

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No. 242 BARNES, 25" All Geared, Camelback, M.D.
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3—24" BARNES CAMEL BACK, All geared, Round table and Stationary Head, Motor Drive

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Pract. New 5' 13" col. CINC. BICKFORD "Super-Service" A.C. Motor on arm.
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3½ Ft. FOSDICK, A.C., M.D. Thru gear box
4' HAMMOND TYPE G, box table, M.D. (2)
6 Ft. AMERICAN UNIVERSAL, Box table, Motor Drive thru gear box
3 Ft. AMERICAN, MAXI-SPEED SENSITIVE, motor on arm
5' CARLTON, M.D.
6' REED PRENTICE M.D.
6' CINC. BICKFORD, M.D.
6' WESTERN

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8-SPINDLE MULTIPLE, No. 4 M.T., M.D., 60" bet. Power feed

TWO OR MORE SPINDLE

4-SPINDLE MOLINE "HOLE HOG," Adjustable rail, No. 2 M.T.
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8" NILES BEMENT POND HORIZ. BORING MILL, Travel of Bar Approx. 6'7"; Overall Length of Bed 25'; Overall Height of Col. 19½'; Motor Drive with Motor.

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FOOTE-BURT 2-WAY DRILLING AND BORING, Power feed M.D.

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PRACTICALLY NEW 36" ROGERS "PERFECT 36" with Side Head, A.C., M.D.
42" BULLARD "NEWERA" M.D.
51" BULLARD, 2 Swivel Heads on Rail, B.G; 50" table
48" ROCKFORD, 3 spindles, 48" rotary table, Hydr. feed, M.D.
42" COLBURN, 2 heads on rail, M.D.
24" BULLARD RAPID PROD. side head, 4 Chuck Jaws, M.D.
4-SPINDLE ROCKFORD, 38" table M.D.

PLAIN

No. 4-B STANDARD BROWN & SHARPE, Dble. Overarm, Motor in Base
No. 3 CINCINNATI
No. 3-B MILWAUKEE, Dble. Overarm, Motor in Base, M.D.
No. 1B MILWAUKEE, Dbl. Overarm, Coupled A.C., M.D.
No. 3-H LEBLOND HEAVY DUTY PLAIN HORIZ., 16x53" table, Dble. Back Grd.; Power feed; Coolant Pump, M.D.
No. 2 HENDEY NORTON PLAIN HORIZ., B.G., 10½x39¼ Table M.D.

THREAD

No. 3 LEES BRADNER, Belt drive

UNIVERSAL

#2B KEARNEY & TRECKER, Dble overarm, A.C. M.D.
#3B KEARNEY & TRECKER, Dble overarm, motor in base

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No. 4 CINCINNATI, "High Power"; No. 10 JACKSON
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PLANER TYPE AND SLAB

72"x60"x15' INGERSOLL ADJ. RAIL PLANER TYPE MILL; one rail head; one side head, A.C. M.D. in excellent condition

42"x42"x13' INGERSOLL SLAB MILL; 1 vert. head, M.D., No. 5 M.T. Power feed

PRODUCTION

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No. 45 PRODUCTOMATIC, Rotary Tables, AC Motor in base
10" PRATT & WHITNEY SEMI-AUTO., 6⅝"x18" table
2—18" CINC. AUTO. 9¼"x36" Table

TURRET LATHES

No. 2-A WARNER & SWASEY, Motor Drive
No. 1-A WARNER & SWASEY UNIV.

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MEMBER

26" LIBBY UNIVERSAL, T.A. Bar feed 7⅛" hole
No. 1 WARNER & SWASEY, Motor Drive, ⅝" capacity
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No. 7 FOSTER UNIVERSAL, Motor Drive, Back Grd., P.F.
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JONES & LAMSON GRD. HEAD, A.C. Motor Drive, 2¼"x24 (2)
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No. 652 NEW BRITAIN AUTO. CHUCKER
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4x60" FITCHBURG LO-SWING, GRD. HEAD, M.D.
51"x22' FITCHBURG Engine Lathe, Internal Face Plate Drive; Double back grd., M.D., 8' bed extension
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20"x10' AMERICAN, T.A.
24"x10' LODGE & SHIPLEY Grd. Head (2)
18"x14' LODGE & SHIPLEY Grd Hd.
16"x8' AMERICAN Grd. Hd., T.A., Chuck
16"x6'6" HENDEY Grd. Hd., T.A., Chuck M.D.
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16x10' AMERICAN Q.C.G. TOOLROOM, 18½" Swing, 1-5/16" spindle
PRACT. NEW 14"x6' LYON ROBBINS, Grd. Hd., Q.C.G., Taper Att.
14x6' LEBLOND Q.C.G., 15½" Swing, B.G.
14"x6' L. & S. Quick Change Gear T.A. 1-5/16" spindle
14"x6' BRADFORD, Grd. Hd., M.D.
12"x8' LODGE & SHIPLEY, Q.C.G., with relieving and taper attachment, Dble. Back Grd., 15" swing, M.D.
12"x6' LODGE & SHIPLEY, Q.C.G., Dble Back Grd., M.D.
12"x5' PRATT & WHITNEY, L. C. G., 1" spindle hole

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2—13x13" PEERLESS UNIV. SHAPING SAWS, A.C., M.D.
9x9 PEERLESS UNIV. SHAPING SAW, Back Grd., M.D.
24" STOCK BRIDGE SHAPER
25" MILWAUKEE Shaper
24" ROCKFORD Shapers (2)
2—10½" P & W VERT. SHAPERS with 24" Rotary Tables
16" WALCOTT B.G. SHAPER
16" WORCESTER SHAPER
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BETTS SLOTTER, 9" stroke, 21½" Dia. Geared Rotary Table, P.F.
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14" NEWTON SLOTTER, 30" table, A.C. Motor drive, 24" throat

NIBBLER

No. 2 SAVAGE NIBBLER, ⅜" capacity, 36" throat, 9¼" gap, M.D.
No. 1 SAVAGE, 3/16" Capacity, 34" Throat

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DOUBLE HOUSING

60"x60"x18' POND, 2 heads on rail, M.D. Power elevation
44"x36"x12' GRAY, 2 heads on rail
20' HILLES & JONES PLATE PLANER with Adj. Pneumatic clamps
1—42"x14' Openside Stone Planer, rail head and side head, M.D.

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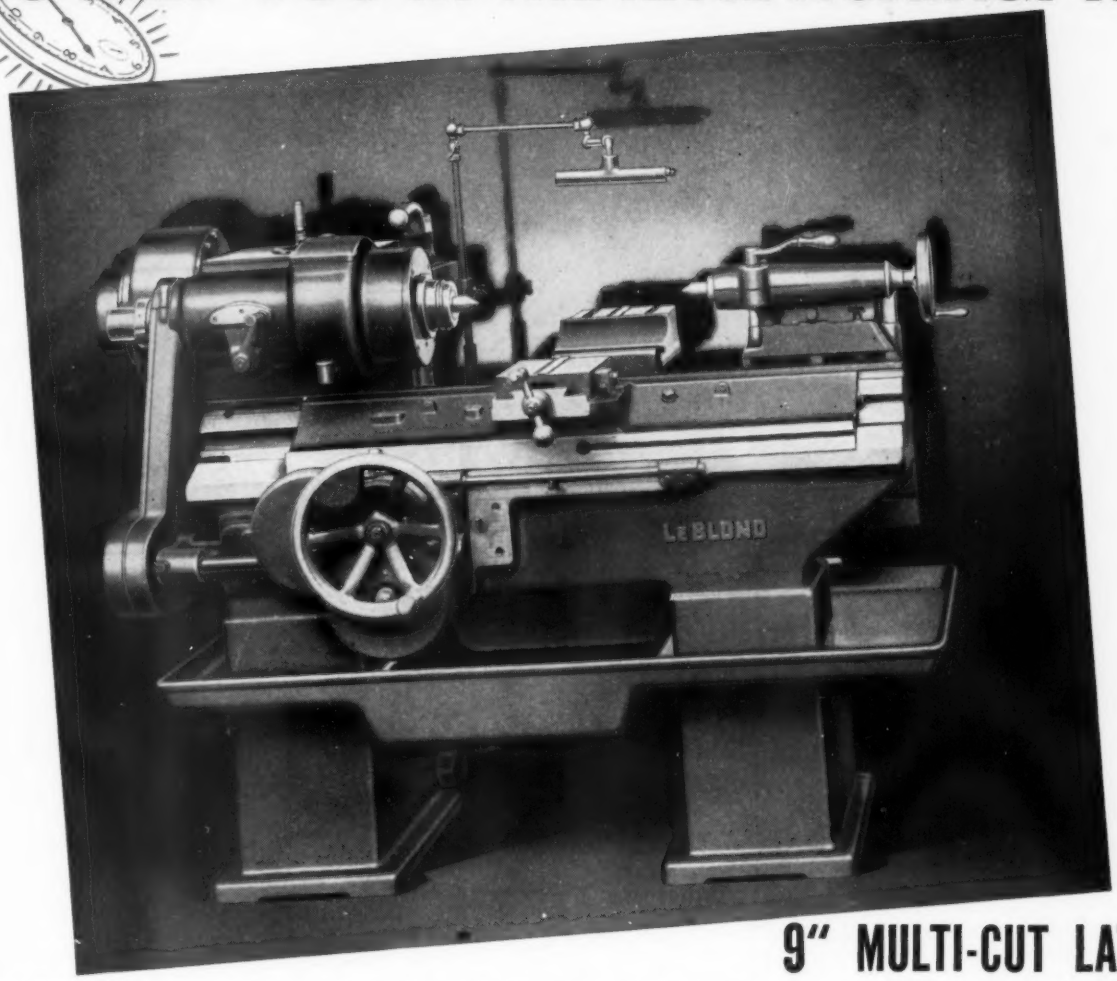

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